The Redesign of Lakeshore Architecture

A Mixed Use Approach to a Single Use Idea

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A Design Thesis Submitted to the
Department of Architecture and Landscape Architecture
of North Dakota State University

By

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for the Degree of
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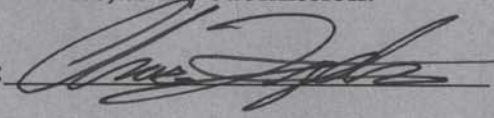
Name:  Date: 5 MAY 2017

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Thesis Abstract

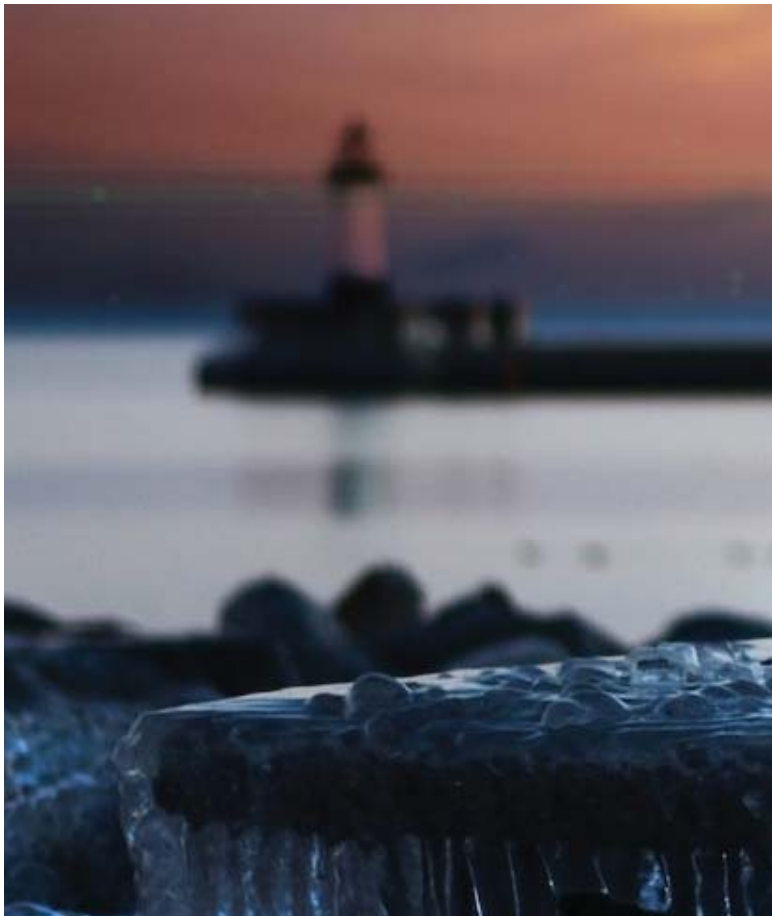
Boathouses are currently banned in Minnesota do to their effect on our lakeshores, but this may not be the right solution to the issues they face. Just because something is outlawed does not mean that it is entirely bad, in some cases it may be as simple as looking at it in a new light. That is what this thesis is about, taking something with a bad stigma and giving it new life. With a mixed use building being used as the primary vehicle, the goal to explore the ways in which boathouses would best be inclined to make their comeback on Minnesota lakeshores. This thesis covers the issues associated with these buildings paired with their potential solutions. The design will also provide insight as to how we can use a building like this to start a fresh relationship between a community of environmentalists and lake goers. The best way to prove a building typology can change is to fill it with potential skeptics. Then the goal becomes impressing them with both the performance and the overall impact of the design. By the end of this thesis one should have a new perspective on the future of boathouses in Minnesota, one without a negative stigma.

Thesis Narrative

Connecting The Dots...

There are many branches that must extend in several directs in order to give a proper explanation of this thesis. The core at which all of these connecting dots converge would be the current stigma on boathouses in Minnesota. The need of rehabilitation for this lost type of architecture in the area is the foundation for all of the other supporting draws to the project. These connecting dots, so to speak, are a series of needs upon the intended project site that go hand in hand with a progressive boathouse design such as this one.

The first of these would be the Safe Harbor as a water front greeting for boaters to approach the site and even enter the building via craft. The next driving support for the project is the current discussion of reimagining the University of Minnesota Duluth's Limnology Lab which currently takes up a portion of the site. This is a group that could greatly benefit from a building of this style while also bringing in users that could learn from it. The other supporting portions of this thesis are the public spaces such as gallery and eating. These are simply another needed element of the area that can truly utilize the building while also helping to complete the vision the project is set to hold. Each of these pieces plays a vital role in thesis itself, which is essentially getting folks involved in turning things around for boathouse architecture in Minnesota.



Thesis, Thesis Statement:

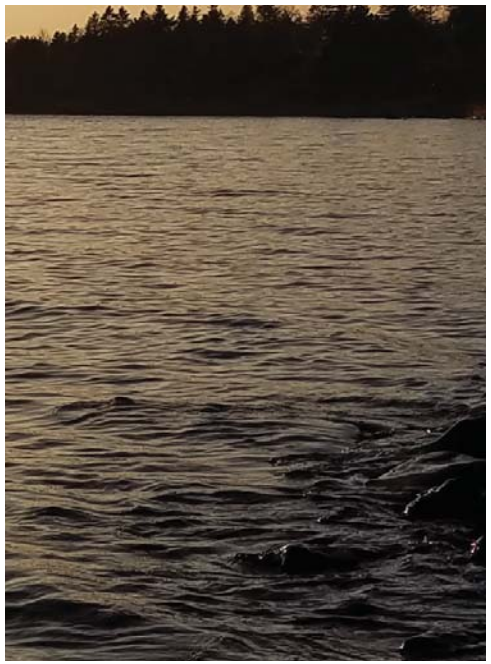
The goal behind this thesis to create a boathouse on Lake Superior that is far less harmful to our environment than the ones currently outlawed by the MN DNR. Once this is accomplished the idea is to take the space and allow people to filter through it in order to see that a sustainable boathouse in Minnesota is a possibility. To secure a set number of visitors annually, the building will cater to three different use typologies. A restaurant, a gallery space for tourists to learn about the building, and lastly the main space will be a research area dedicated to the lake on which the building rests.

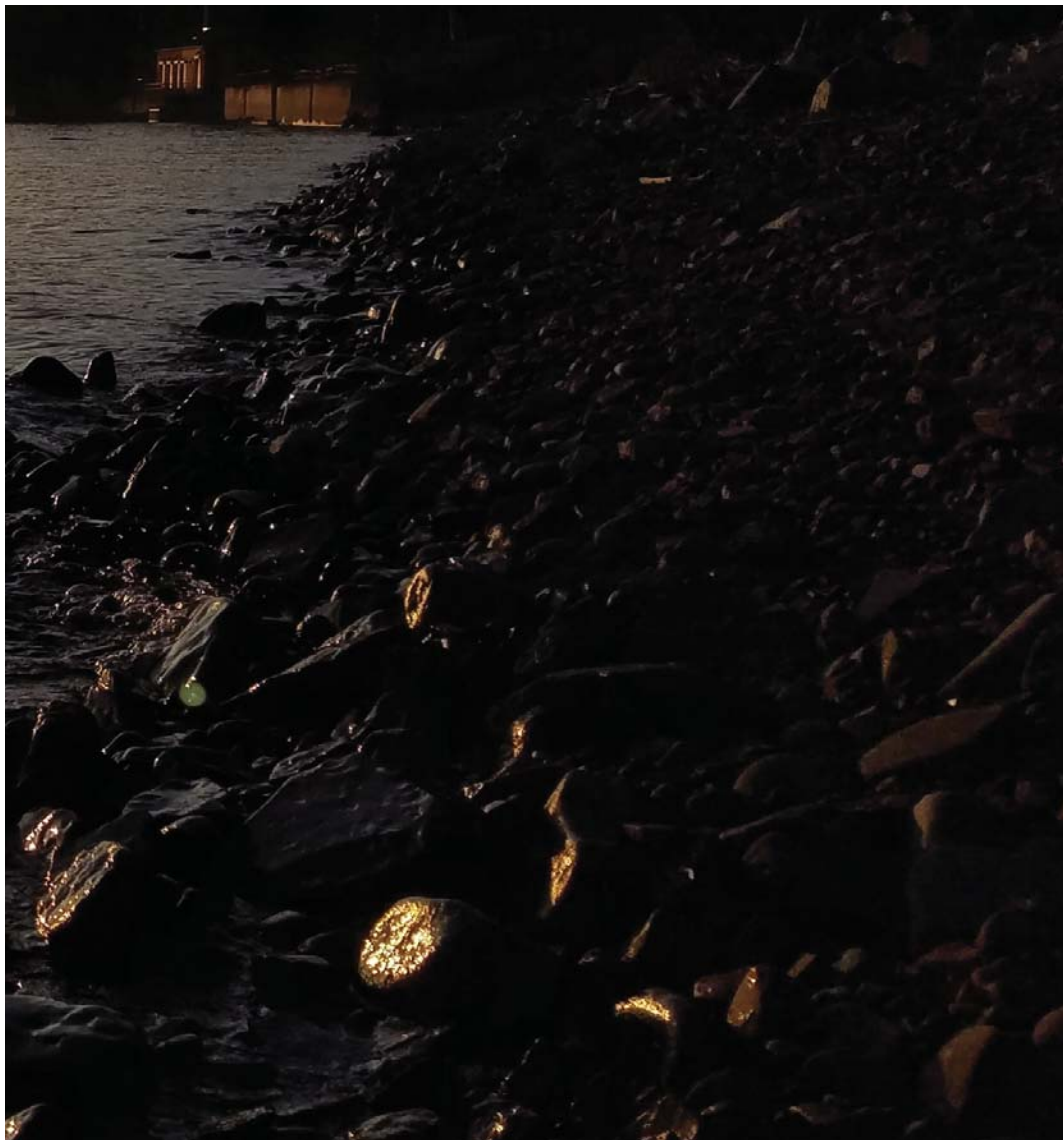
Mixed Use...

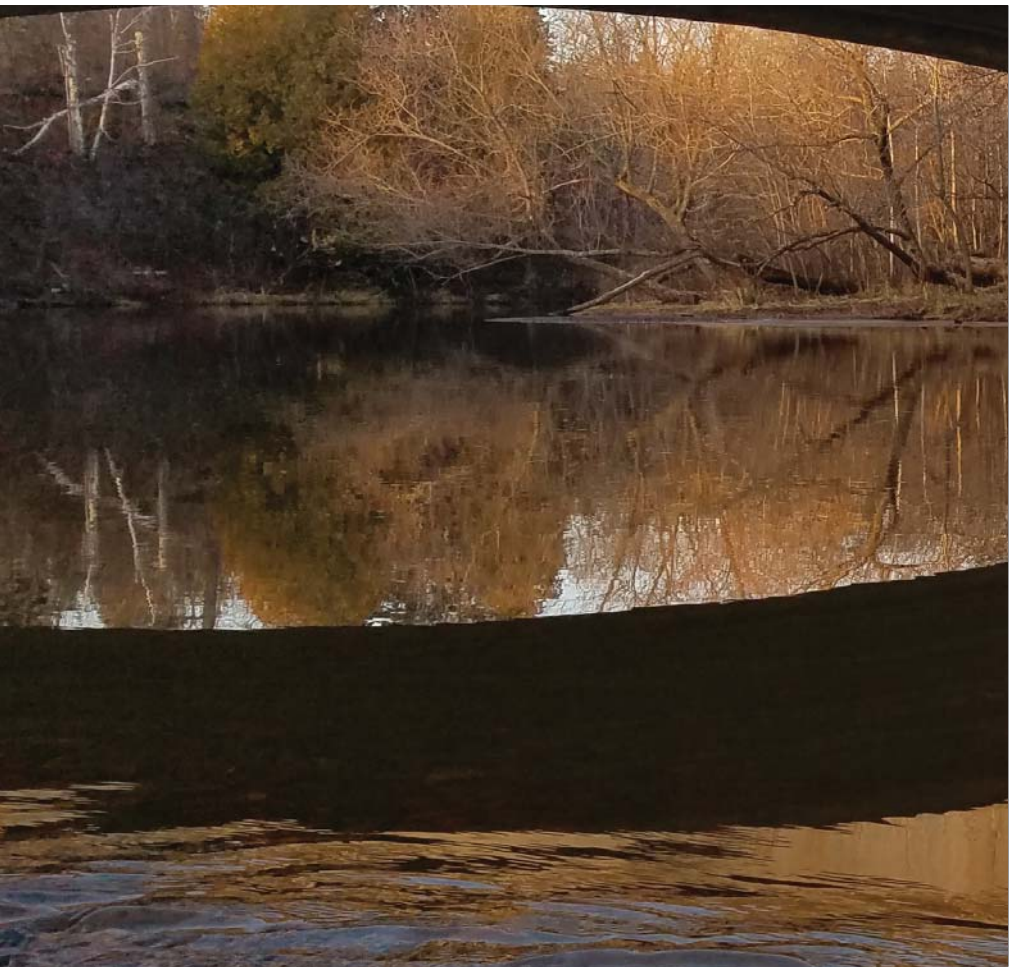
This mixed use project incorporates these three spaces not only because they are needed in this particular area of Duluth, but because each creates its own set of opportunities for people to interact with the building. The restaurant / bar space will be the first of its kind in the Lakeside neighborhood of Duluth since the alcohol ban which was put into place in 1893 and was just recently lifted. This would create the draw a space like this needs, the first nicer restaurant in Lakeside that wouldn't simply have a lake view but would actually put guests upon the water. These spaces are known to bring in crowds and with this being the first in the area since the alcohol ban was lifted, it would hold a bit of a monopoly for the area.

With the site sitting between the start of a major Lake Superior tourist route (HWY 61) and the lake itself, there is a great opportunity to let folks stop and learn about the lake and the building before proceeding up the North Shore. This is where the Gallery space comes into play as a draw for people to see the building. It allows for a variety of people to visit, from those leaving the restaurant, taking a breach from the Lab space, or simply stopping along their way along the lake shore drive.

The last and likely larger of the mixed use spaces is the Laboratory for the University of Minnesota Duluth's Limnology Center. This is a more private space for researchers but will still hold the opportunity for public tours during the busy seasons. Here is where the building meets the water on a more commercial level. The boathouse garage area is at water level beneath the other spaces. This is mainly designated for the watercrafts used by the Limnology Lab.







Of The Place...

Though the building is to be the first of its kind for the area, it will be designed in a fashion that allows it to blend seamlessly with the style of its surroundings and the culture Duluth's lake shore as a whole. To accomplish this three general goals will need to be achieved. The aesthetic of the building must find the meeting point between rustic cabin and sleek modern as that has been the timeless style of Duluth's lakeshore in the past. Secondly it must look and more importantly perform as a low impact design on the set environment both in the water and on the land. Lastly its most ambitious challenge is to battles its obstacles at hand in a sustainable way. These obstacles include the natural elements of water, ice and damaging winds produced by the lake during its more severe months.

Project Emphasis...

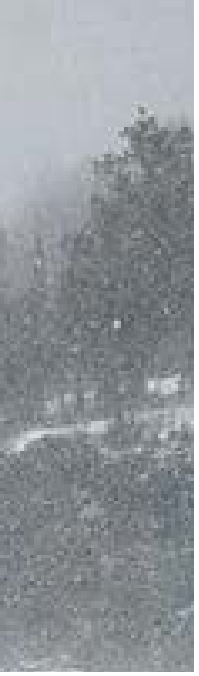
The bulk of this project will put emphasis on the sustainable methods we are capable of using when battling the harsh natural elements the average MN boathouse is exposed to. This means that material use will be a very large player in the overall design both in regards to the structure as well as the exterior skin. The issues experienced by previous boathouses which gave them a bad name was usually in the category of poor material choices. So for this project to shine there must be a very deliberate and thought out material list. These materials will be made visible to the public as both a show of the new standard but also as an educational tool. By seeing where we have gone wrong in the past we then have the opportunity to do things better in the future. The emphasis for the project will be the display that the future allows for the return of the boathouse, and the future is now.

Goals...

Looking into specific goals for this thesis we see some common repeats with the previously mentioned spaces. The first and foremost goal is to not just create a sustainable boathouse design but to breathe new life into the Minnesota boathouse concept as a whole. This is in hopes that other designers would take note from this concept and build upon its progress in order to continue the advance of the design. The hope is that this thought process would take hold and lead to the repeal of the ban on MN boathouses being constructed or redeveloped. To summarize, the goal is to create something that will reverse the view from environmentalists as to how boathouse effect out lakeshores and waterways.

Another goal that has been mentioned is the creation of a new communal space in the Lakeside neighborhood of Duluth. With a neighborhood population of over 8,000 people along the shoreline the area is a prime host for a new community based project. Paired with the building is a marina area for boaters to visit the site via the water. This marina provides the opportunity for not only craft storage and a break for ice and waves, but as a unique outdoor environment for the public. The goal for this element of the community space is to incorporate the river mouth on the site, the water, land and the building all into one cohesive outdoor design for folks to enjoy.

Also on the site will be an area for boaters to remove their crafts from the water after a day on the lake. This space will include a boat cleaning station connected to the research lab so that scientists and student of UMD may monitor what invasive lake species are trying to hitchhike their way onto other inland lakes. The goal behind this is to have yet another aspect of the project devoted to doing right by the lake and its environment.



As mentioned before a large piece of this design will be the involvement of the Limnology center from the college. This limnology activity already occurs on the project site and the school is currently looking into what else they are able to do in regards to improving or altering the way thing are run there. This puts emphasis on the importance of this element being included within the project design. A goal in improving this is to take the system currently in use by the school and connect it to the rest of the project. This will be done is a way that both creates a more efficient and user friendly space for the school while also allowing opportunity for celebration of the great work that is being done there.

User / Client...

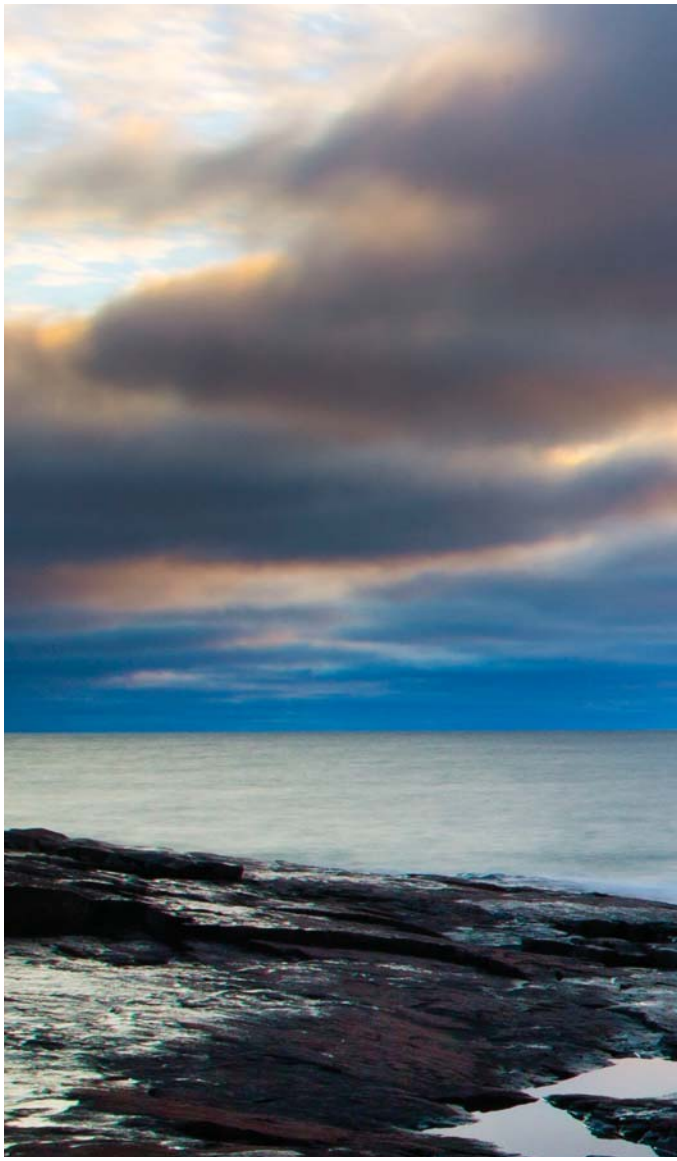
Since this is a mixed use building the users within the layout vary greatly. As discussed early there are three main clients within the building design, Public Gallery, Private-Public College Lab and Public Restaurant / Bar space. The gallery space will be open to the public but managed by the College since many of the displays in the space will be produced by the Lab employees and students. This joint venture for the gallery will ensure a constant change in events and displays along with proper funding throughout the slow winter months.

The UMN Limnology Lab space will be the only semi detached portion of the building to put emphasis on the fact that it is a more private public space. This portion will be run year round less scheduled holidays and break for students and staff. It will prove as the backbone for financial support to keep the facility afloat pending slow periods throughout the year.

Lastly the most public and engaging interior space of the building will the privately rented restaurant space with back deck and front patio. This will cater to both tourists heading up the shore or locals from the surrounding neighborhoods. It will be the gathering space for boaters to meet and have a drink after a long day on the water or for students leaving the lab. The restaurant space may be the wing to the side, but the heart of the project. For this are the emphasis will be put on the view to the lake and overlooking the marina below.

Project Justification...

- Technology now exists to make boathouses less harmful to the environment
- It is important that we don't let this unique type of architecture die with our ancestors
- We must always push the boundaries of what architecture is capable of or we will forever be at a standstill
- A safe harbor / marina is needed in the 11 mile stretch between downtown Duluth and the McQuade Safe Harbor
- A Restaurant has yet to take advantage of the recent lift on the alcohol ban in Lakeside, Duluth, MN
- The UMD Limnology Lab is looking at options to alter their facilities on the current site
- Boat cleaning stations are becoming more important as invasive species are starting to take over many MN lakes and streams



Research Design Plan...

Design Methodology - Since a boathouse design for an area that bans boathouses is a rather unique problem to solve, it requires an equally unique design methodology. The system or process that is to be used during the development of the project will be a direct result of the solutions given for each of the obstacles previously mentioned. This means that a series of questions regarding the layout and structure of the project need to be asked with several potential solutions in mind. Each of these given solutions are to be weighed as to how well they serve the people, the environment and the area as a whole. Once the most appropriate answer has been selected for each issue, the design will slowly piece itself together.

Process Plan Documentation - Closely related to the design methodology is the design process plan documentation. The documentation of the development progress will be compiled on a bi weekly basis with a summary as to what has been accomplished as well as the next terms goals. This will allow for an accelerated view into how the end design has emerged once the project is complete.

Project Schedule - The project schedule for the Spring 2017 Semester will be planned out on a weekly basis for tasks to be competed. Though these deadlines will be subject to change, as the project will surely evolve during the design process, the first few will remain firm in order to get the ball rolling. This week by week deadline schedule is strict enough to ensure progress is being made at any point in the semester. But it is also lenient enough to allow for impromptu events such as site visits and alternative research opportunities.

Research Paper

Lester River Boathouse:
A Study into the Rebirth of a 1970s Craze
Chase Fjelstad
North Dakota State University

There has been a certain stigma with boathouses and their harsh effects on lakeshores within Minnesota. This finding has led to them either being banned or putting limits on their repairs, but this may not be the correct answer to the issue. Rather than letting these buildings crumble into the land over time, the better choice would be proper removal and replacement with a superior design. Through a large scale boathouse paired with a multi-use marina based on Duluth's lakeshore, we can set the new standard for what it means to build along a shoreline. This facility would display a long term solution to the current issues related to boathouses on Minnesota lakeshores. The architecture will create a space that not only educates visitors about the issues paired with their solutions, but shall draw them into the unique relationship between building and shoreline. Displayed in plain view, will be the proper foundation, structure, architectural style and material use which can all sum up ways to limit negative impacts on the local environment. Through the utilization of these elements we can create a new style of lakeshore architecture that will replace boathouses as we currently know them. But we can't simply do this through a static building alone.

To truly drive home the importance of this facility and its improved environmental impact, it will play host to multiple venues that will help to deliver this message to the public. Some of these venues will include educational, recreational and event spaces. Potential tenants to fill these venues range from the local colleges to government entities or private parties. This thesis will dive into the issues encountered in the past along with solutions for the future. While both addressing the side of architecture along with its environmental impacts, it creates a recipe for something that is not only new but necessary.

Although the origin of traditional boathouses can be traced back to the early 1800s the styles in question are a part of the 1960s era. A craze started on lake properties in Northern Minnesota in which people would build a fully functional garage right on the shoreline for convenient boat storage without the hassle of towing. The structures would usually be on rock cribs or concrete footing foundation systems elevating the building just above the water line. This was supposed to allow for heavy waves and ice to strike the structure without causing too much damage.

As the 70s and 80s came, these structures became more and more modified. Owners would add lower decking to them or better yet, many had decking installed atop the garages. In a few cases the additions would be so intense that there would be a livable space added to the top of the building so that they could be lived in during the summer months. What was once a simple form intended for watercraft storage had eventually morphed into a three or four season multi use structure, resting directly on the shoreline.

An example of how this can be problematic is seen in the dispute between the Department of Natural Resources and the Winona Boathouses Association in the early 80s. A community of boathouses had taken over the shores of the Mississippi River in Winona, MN. The DNR stated that “the structures pose a danger to the environment by interfering with the natural river habitat.” It was also noted that “owners had been careless about proper disposal of sewage.” (News, n.d.). This issue displays a main factor in why boat houses have the stigma that they do today, owner negligence. It was later noted by officials that “potentially hazardous structural problems such as loose floatation barrels and dangerous wiring were on many of the boathouses.” (News, n.d.). This was the start of a long list of regulations being made in order to clean up the boathouse dilemma and protect natural waterways.

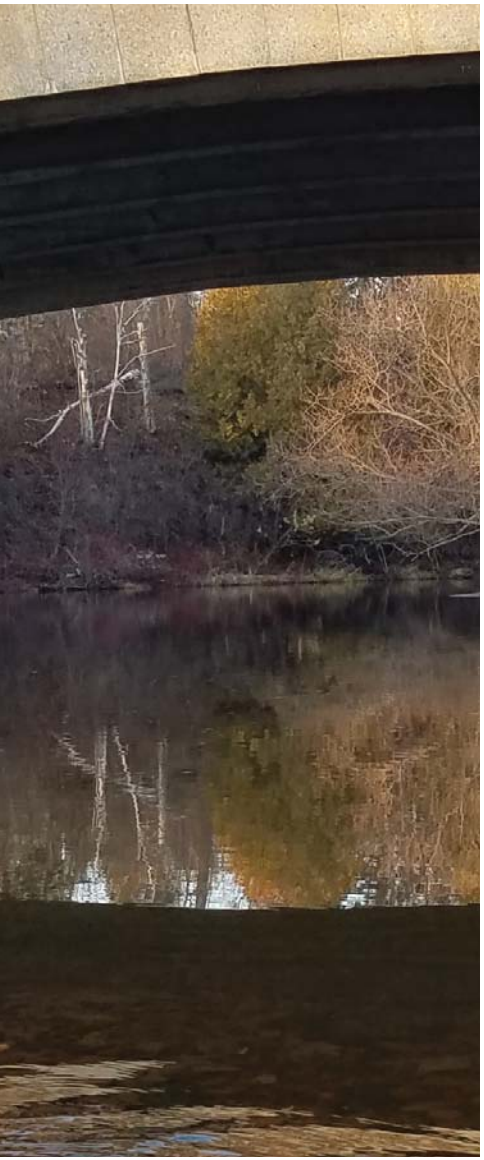
Since the original design of these buildings was simply geared for storage, they weren't nearly as well-crafted as other structures along shorelines. Over time normal buildings would have aged some, but the wear and tear becomes compounded by the water and ice damage that comes with the seasonal changes on a boat house, as seen in the Winona case. This combination of age and water damage, allowed many of these buildings are becoming weak and unsafe to occupy. As stated, this realization has led to restrictions on new construction for boat houses as well as limits on repair for existing ones. The thought is that by creating these limits recreational boat houses will be phased out altogether, to avoid crumbling structures along our lake shores. The trouble is that by limiting the repairs we are then encouraging the use of these structures "as is" which still leads to debris flaking away into the natural environment. Which is exactly what happened to the WBA in the late 80s.

Apart from the regulations in Minnesota there are some communities that have embraced to boathouse concept as a benefit. Lake Muskoka in Canada is a prime example of luxury boat houses being employed on a freeze thaw type lake. All homes on the lake go for around one million dollars or more and most are paired with a 3-4 stall boat house. All are done in new, up to code design regulations, such as "a boat house may only take up <16% of a properties shoreline and only 10% of the acreage within 200 ft of the water can be covered in structures." (Journal, 2016). These proactive regulations resulted in a very different and successful boathouse story. One where structures are built well and allowed to be well kept resulting in less issues.

Currently the Minnesota DNR bans “boat storage structures” on Minnesota lakes and streams. They state that “structures located below the ordinary high-water level of a surface body of water have been prohibited since the 1970s,” (“Division of Ecological and Water Resources: Water Publications and Presentations: Minnesota DNR,” n.d.). Though this was later changed when they allowed for structures built before 1979 to be repaired or replaced with restrictions. This means most boathouses in MN will be forced to waste away without allowable repair or have minimal repair to dated structures that won’t last too much longer anyhow due to their pre 1979 construction methods.

This is an issue that needs fixing not just to avoid harm to the environment, but to prevent the loss of an era, one of lively lakeshore architecture. As far as the environmental importance, it is necessary to look at who all is affected on both a micro and macro level scale. The immediate damage is usually caused by pieces of the building breaking off and falling into the lake or stream on which the structure was placed. These pieces can contain many harmful chemicals that damage the water life in that area. If there are enough boat houses on a lake in this same condition it can damage the whole ecosystem for that particular body of water, which in turn affects all creatures that may use that water to survive.

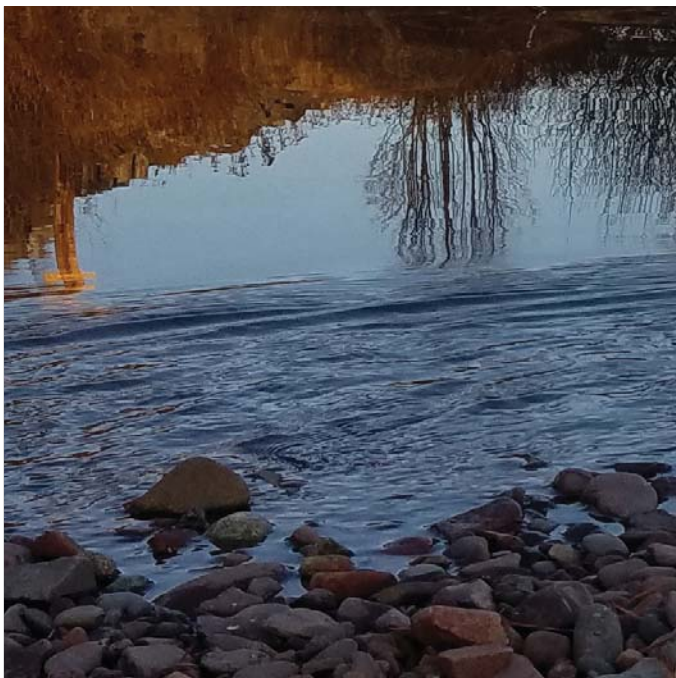
Referring to the architectural end of the spectrum, removing these buildings shouldn’t be the solution either. If we got rid of a building every time it posed a threat then we wouldn’t have anywhere to call home. In June of 2003 an article was published discussing the Wisconsin DNR and their regulations against the boathouse owners in La Crosse County. Over the years they have brought down the number of boathouses from over 500 to just 123. The original restriction was to eliminate both existing and limit restoration to 50% of the value of the boathouse, but there was too much debate. Therefor the DNR allowed repairs to the remaining boathouses as long as the footprint did not increase. This solution allowed for proper repairs, which in turn limited the amount of decaying boathouse debris that entered the waters. (staff, n.d.).

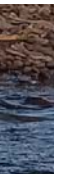


The evidence from the article shows the key is not to remove but replace and reinvent. These buildings were put up for a specific purpose, a purpose that has slowly adjusted as the time has passed. The ideal solution would be to allow the adjustments to continue until the end product serves the need in the most sustainable way possible. This project will be that ideal end product. The goal is to take the boat house along with its improved attachments to a level that allows for not just a two season temporary use structure, but a year round fully functional building.

The program for this facility will involve several different features, and each one will play host to a specific set of spaces. The most prominent of the features is of course the boat house portion. This piece will be the foundation for the rest of the building to sit upon. The basic layout of the boat house will be a multi slip style garage layout for smaller boats paired with a larger hanger style space for the larger vessels. Connecting the boat house space to the rest of the design will be the boat landing area. This is for addition or removal of water crafts from the marina space surrounding the boat house.

Atop the boathouse will be a two story building that is divided into three different sections. Each section will be a unique occupancy type and specifically designed around the activity that it will host. One section will be a gathering space, the second a culinary space and the third is for research.





The building as a whole will be placed on a site in the Lake Superior port city of Duluth Minnesota. Just as the city limits end on the north shore of town is the Lester River which runs into Lake Superior. This will be the intersection on which the boat house, marina and its supporting facilities will sit. The reasoning behind using Lake Superior as a host is that it would prove to be the ultimate test for a redesign of the boat house concept. With hurricane force winds, 20 foot swells and moving winter ice that can bend steel, the lake would help display the true strength behind the architecture of the project. In 2010 there was a wind storm on Lake Superior that could match the requirements for DADE County Wind specification for Florida's hurricane zones. Waves rose 12 feet in 2 hours reaching 25 foot swells and the Indiana Harbor reported instantaneous winds of 144 mph (US Department of Commerce, n.d.). A structure design that is capable of dealing with these types of conditions would be bullet proof on smaller Minnesotan lakes. This creates another opportunity for the building to stand as an example for correct lakeshore construction that will last through our seasonal changes without crumbling years down the road.

Another driving factor in choosing this particular site is safety. An issue with Lake Superior is that with the large hill all along the north shore it can be hard to tell when nasty weather is approaching. To keep sea farers out of harm's way, there are safe harbors every 7 miles or so along the shore. The problem is that there happens to be a gap of 11 miles between downtown Duluth and the next safe harbor. ("Division of Ecological and Water Resources: Water Publications and Presentations: Minnesota DNR," n.d.)

With the large population of Duluth, there is need for an extra safe harbor in between the current ones near the city, which will better serve the heavier boat traffic. This halfway point happens to be just a mile away from the chosen site making it the right place for the safe harbor that connects directly with the project. Safe harbors on this lake are usually a buildup of rock around the marina to break both large waves and damaging ice in the winter. The rock features not only create an opportunity for unique landscaping but help to protect the building and its components.

A key factor in choosing the site for this project is the fact that a section within the building is designated as a water research space. This means that having the river and the lake close by for people to monitor will be a huge convenience. With this combination being within the city limits it makes the research space very attractive to local businesses and colleges.

The spaces within the building portion of the project will be designed with varying degrees of security depending on use. The layout is a set up with a central core and two wings. The northern wing is the research area and will be the most secure. This space will be dedicated for the University of Minnesota Duluth Lake Superior research labs and class rooms. The central core will be a community gathering and educational space for the public to hold events and teach. This will be the least secure and very open to the public so people may learn about the lake and boat house interaction. It is where students and faculty from UMD can encounter the public and shed a little light as to what is happening below the surface of the water that they see. The southern wing will have a mild amount of security as it will have a restaurant and recreational space. This wing will be the driving factor to bring the public into the space. It will have large patio areas with access down to the boathouse and dock area.

The dock area is where the information gained through UMD can really impact the lake through boaters. When removing their boats people will have to tow them through a set of inspections spaces with cleaning stations set up by the University. Since the Great Lakes is one of the main culprits for introducing invasive species to our water ways, it is important to help reduce exposure on other lakes through recreational crafts. The three most well-known invasive aquatic species in this area are the Zebra Mussel introduced in 1988, The Sea Lamprey introduced in 1947 and the Spiny Water Flea introduction date unknown (Fields, 2005). Though these are the most prevalent of the invasive species for Lake Superior right now, they are also some of the easiest to detect and remove from water crafts. With a basic boat inspection and cleaning station connected to the marina we can dramatically limit the amount of aquatic hitchhikers that could spread from Lake Superior to other inland lakes.

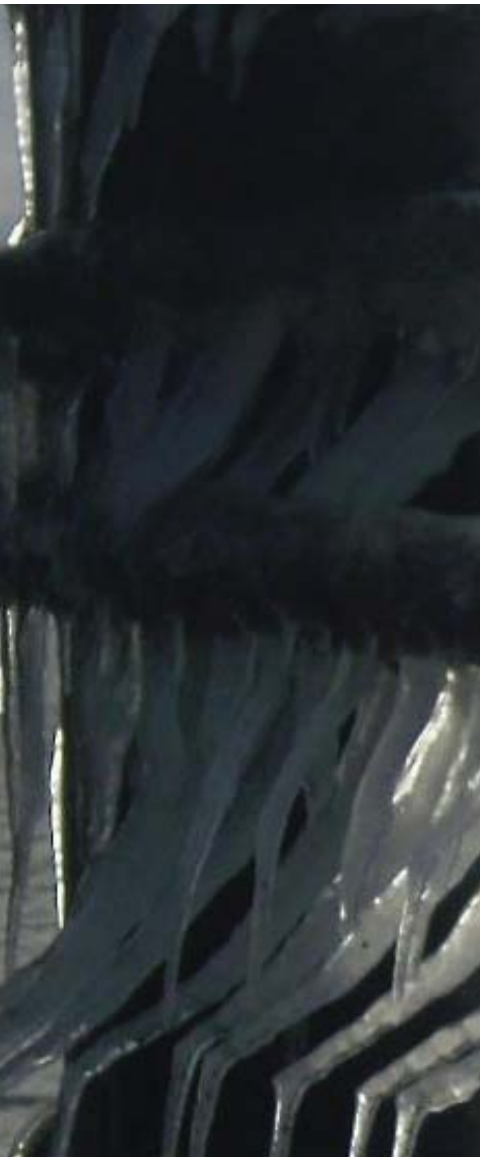
The message that this building is meant to send is shown through solution to the usual flaws in the typical boathouse design. The finished product will subtly brag about each obstacle is has overcome. There are four main issues that the facility will have addressed. The first issue is water and ice damage to the base of the building where it meets the water. The initial brute force of the waves and moving ice can be tamed with the rock safe harbor feature. The peninsula feature will curve around the Eastern end of the marina to block the typical wind patterns of the lake with a secondary section of earth to the southwest to block ice movement in the winter. Even with these immovable element there is still some force left to deal with. Ice can still find its way through the canal between the peninsulas and put pressure on the structure given the correct wind direction. The best way to approach this would be to split the larger chunks of ice with Portland cement caissons preceding the concrete boathouse foundation. This initial set of columns would break up the plates of ice, making it much less powerful and easier to divert around the building ("Boat House Design for Ice - Structural engineering other technical topics - Eng-Tips," n.d.). All concrete will be cased in steel to further protect from ice damage. The siding of the building will be raised above the water line to avoid contact throughout the year. Boat access from the concrete docks will be gained through attachable floating docks so they may be used no matter what the water level. This allows the project to have a strong core against the water issues yet still serve the needs regardless of the lake's changing water level throughout the year.

The second obstacle is using sustainable finishes that won't flake away and harm the wildlife. Though it sounds simple there aren't that many products that will last 50 years and still look good once exposed to these elements. "When water freezes, it expands about 9 percent. If the pressure developed exceeds the tensile strength of the material the cavity will dilate and rupture." ("Freeze-Thaw Resistance," n.d.). This means that mostly tough metals and Portland cement masonry products should be used on the exterior of the project that will be in contact with the immediate shoreline. It is also important to note the conditions in which products will be installed due to the warmer setting temperature for some products to receive full strength capabilities to ensure durability. Therefor construction would have to begin early to mid-summer for Duluth weather conditions to cooperate.

The third issue is to have a structure that fits in with the beauty of the landscape rather than pops out of it. Earthy color tones and architecture that matches the modern rustic look of Duluth's surrounding buildings will be used. This is to help the project enhance the shoreline rather than over power it. Most public recreation buildings along the north shore of Lake Superior have deep browns and varied tan tones to help bring out the natural feel of the site. The building will have that modern cabin feel that Duluthians and tourists have become accustomed to.

Although the last issue is subject to building use it is still important and that is to make the building space desirable year round. Most boat houses are used only during the summer and a select few may be used in the late fall. This facility will display features that allow for it to be comfortably used year round, without seeming out of place. This is done with ample insulation between the exposed boat storage units and the floors above, as well as outdoor spaces than can be used when the marina freezes over. Between the restaurant space and research space, there will be plenty of activity the keep the facility filled year round.

Though the strategies and concepts described above may only scratch the surface of what it means to reinvent the design of a boathouse, they do however serve as the backbone for what the final design will rest upon. The complete program proves that although there can be negative effects from the old versions of boathouses, there are certainly ways to avoid them and start a new trend. This large scale boathouse partnered with a multi-use marina on Duluth's north shore of Lake Superior will dictate new standards for the future of this style of architecture. With guidelines in the areas of structural foundations, material use, architectural style and an emphasis on education, the facility will not be the next generation, but an entirely new approach to boathouses. The result on a macro level being a domino effect of environmental consciousness and proactive sustainable practices within the future of shore line construction.



Annotated Bibliography

Boat House Design for Ice - Structural engineering other technical topics - Eng-Tips. (n.d.). Retrieved October 9, 2016, from http://www.eng-tips.com/viewthread.cfm?qid=327570
This article was a recorded discussion between a group of licensed structural engineers regarding ice loads on a boathouse design for northern Minnesota. The main problem that they were attempting to tackle was to issue of moving ice due to wind loads and the possible impact of ice on a concrete foundation below the average high water level of a lake. the overall consensus was that one must break up the ice as it hits or before it hits the main portion of the foundation.

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Fields, S. (2005). Great Lakes Resource at Risk. Environmental Health Perspectives, 113(3), A165–A173.
Scott Fields put together an article for the Environmental Health Perspectives journal in 2005 about the issues facing our Great Lakes in the US. The point of focus used in this thesis is the section on invasive species within the Great Lakes. The article explains that the culprit behind the invasive species that have infiltrated the water ways is human error. Shipping vessels are the main contributor for bringing in unwanted and disruptive aquatic life. The article states that though the dangers to the lake system are great there is still time to undo some of the damage, though it may take many years to resolve.

Freeze-Thaw Resistance. (n.d.). Retrieved October 8, 2016, from http://www.cement.org/for-concrete-books-learning/concrete-technology/durability/freeze-thaw-resistance
This article put out by PCA and displayed on cement.org dives into the problems with concrete and its resistance or lack thereof towards freeze thaw in wintery climates. It explains in detail the different types of damage that can occur to cement / concrete through the action of freeze thaw. Fortunately the article provides solutions to the problems that it talks about along with methods in how to avoid most of the issues from the start. In regards to construction, the article explains the appropriate mixture of Fly Ash into concrete depending on the time of year and temperature to achieve the maximum strength needed to resist freeze thaw.

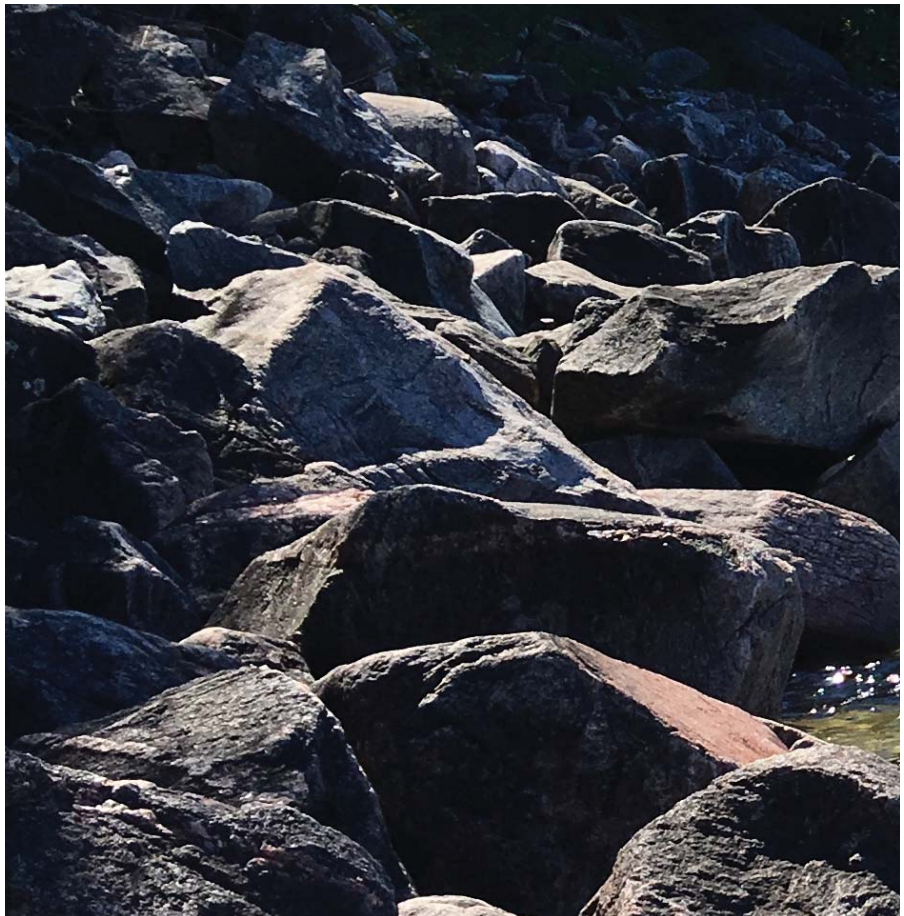
Journal, L. K.-C. | P. by J. R. for T. W. S. (2016, September 1). Muskoka, Canada's Vacation-Home Haven, Gets a Modern Makeover. Wall Street Journal. Retrieved from http://www.wsj.com/articles/muskoka-canadas-vacation-home-haven-gets-a-modern-make-over-1472739690

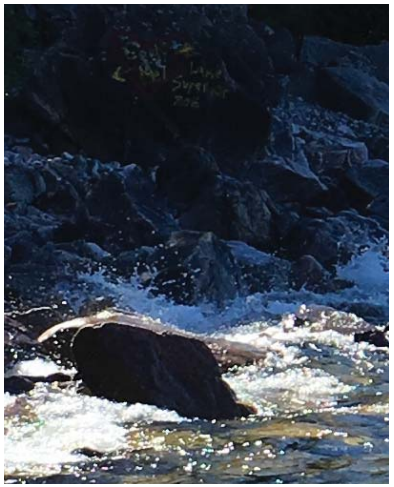
An article from the Wall Street Journal by Leigh Kamping-Carder explain the Canadian version of the Hamptons. Muskoka is a series of lakes in Canada just two hours away from Toranto where almost all of the properties are worth 1 million or more. It is home to some of the most luxurious boathouses in North America and the article explains how the officials keep things regulated. Essentially there is a given percentage of waterfront and over all property percentage that can be dedicated to shoreline buildings. The key is that this is a wealthy area and all of the boathouses are very well designed and very well kept so there are no issues with them falling apart or contaminating the environment. The lakes prove that when done right boathouses can be more of an asset to a property rather than an environmental issue.

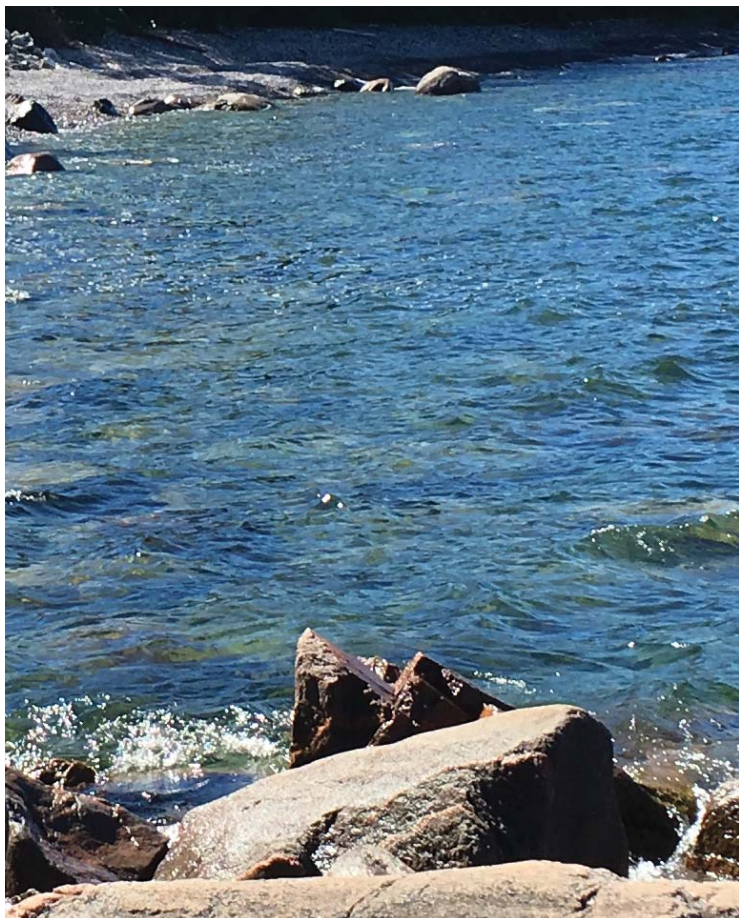
News, E. C. F. the W. D. (n.d.). Boathouses have sparked debate for years. Retrieved October 8, 2016, from http://www.winonadailynews.com/special-section/pieces-of-the-past/boathouses-have-sparked-debate-for-years/article_f1c5250f-a7c4-58e1-a339-ec6d3e1aba66.html
This news article done by Erin Christenson at the Winona Daily News explains the struggle between the DNR and a community of delinquent boathouse owners along the Mississppi River. It shows an example of the public and officials getting frustrated with boathouse owners who aren't addressing the issues properly. The article explained the restrictions that took place in the 1970s along with saying that many boathouses built before 1979 are allowed to stay but with limited repairs. The issues with limited repairs being harmful to the environment was also discussed.

staff, L. M. of the T. (n.d.). DNR enforces rules designed to make boathouse residents a dying breed. Retrieved October 8, 2016, from http://lacrossetribune.com/news/dnr-enforces-rules-designed-to-make-boathouse-residents-a-dying/article_c4741fec-66de-55b5-887c-a33a7b7acefb.html
Linda McAlpine of the Tribune staff in LaCrosse WI did an article on the boathouses along the Mississippi. It explained how the DNR along with other officials slowly diminished the boathouse population to 20% of its original count. The regulations in this case were that residents could only repair the structures up to 50% of their value. This resulted in crumbling houses that polluted the river. The regulation was eventually changed to allow repairs but limit square footage. This was seen to be a semi productive way to deal with the aging structures without completely discarding them.

US Department of Commerce, N. (n.d.). The Fall Storm Season. Retrieved October 9, 2016, from http://www.weather.gov/mqt/fitz_gales
This article by the National Weather Service showed the vast swings in behavior for the wind patterns on Lake Superior. On three separate occasions over the past twenty years the lake has produced hurricane force winds and up to 25 foot waves. The article gave truth to the notion that Lake Superior would be the ultimate test for a lake shore structure designed to battle the elements and prevail. In 2010 an unusual October wind storm resulted in 100 mph sustained winds with gusts hitting 144 mph. The lake allowed swells to swallow the main piers Duluth's canal entry. It recorded the power of not just the winds and waves of the lake but it capability to test architectural structures.







Georgian Bay Boathouse

Case Study 1 - Georgian Bay Boathouse

Architects: Weiss Architecture & Urbanism Limited

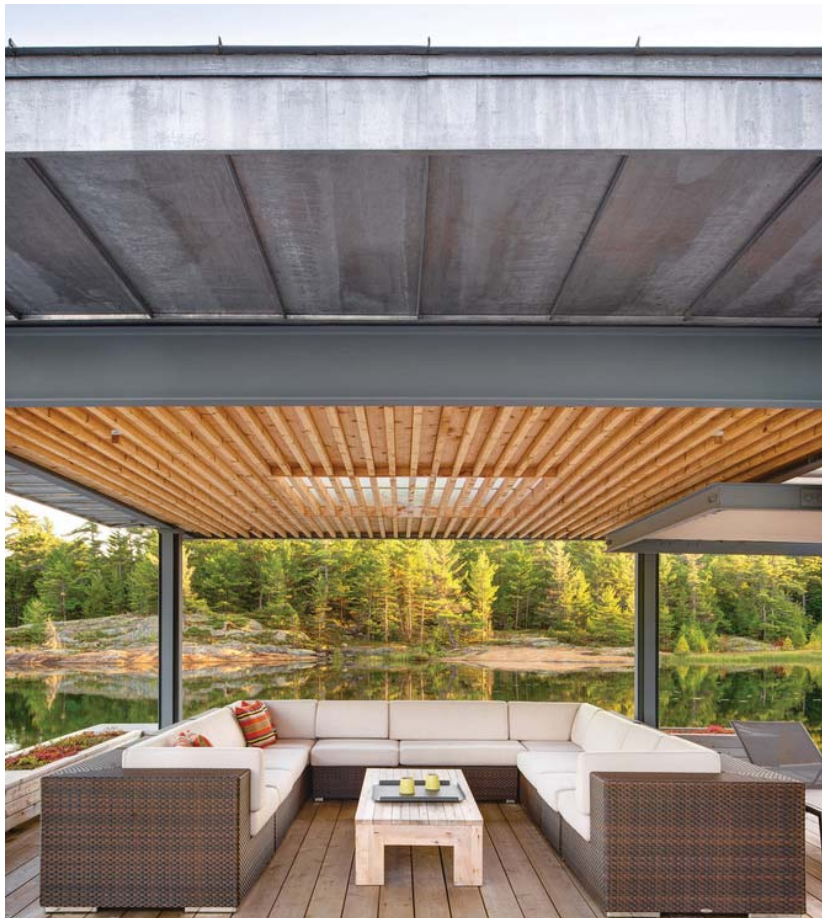
Location: Parry Sound District, ON, Canada

Architect in Charge: Kevin Weiss, Maya Przybylski

Project Year: 2014

Structural Engineering: Blackwell Engineering

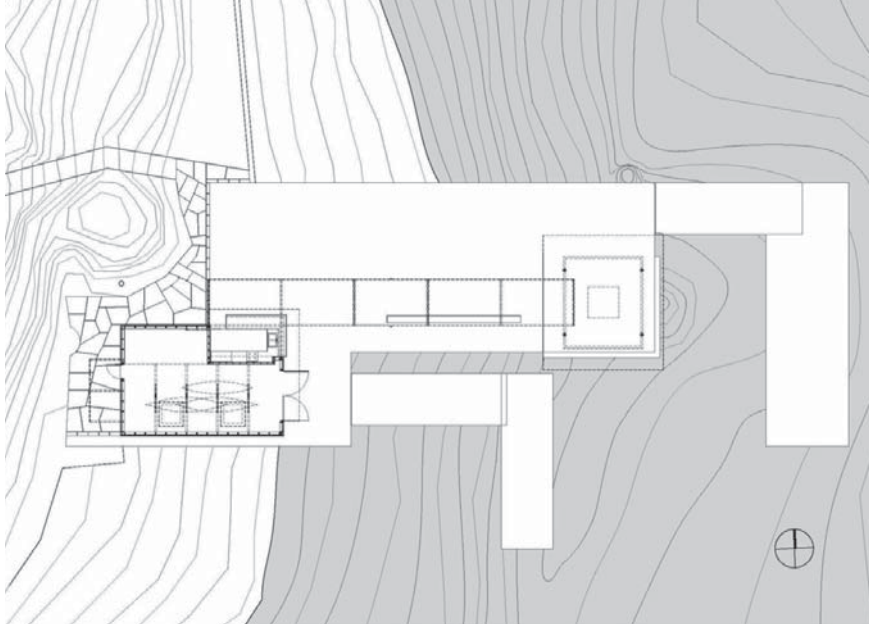
Source: http://www.archdaily.com/599819/a-modern-boathouse-in-a-canadian-landscape-weiss-architecture-and-urbanism-limited

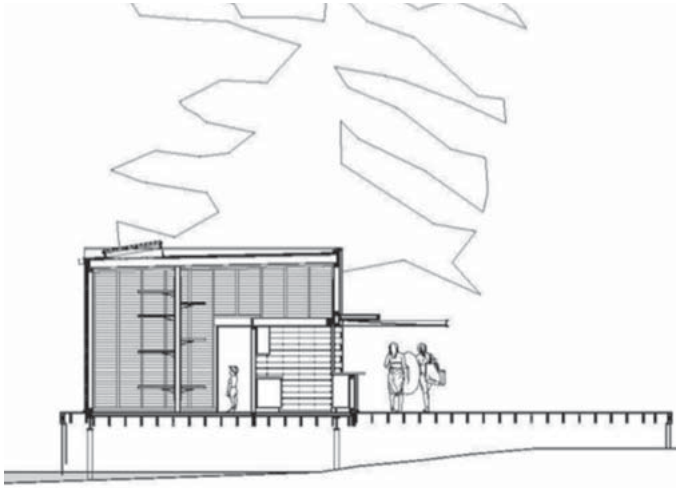


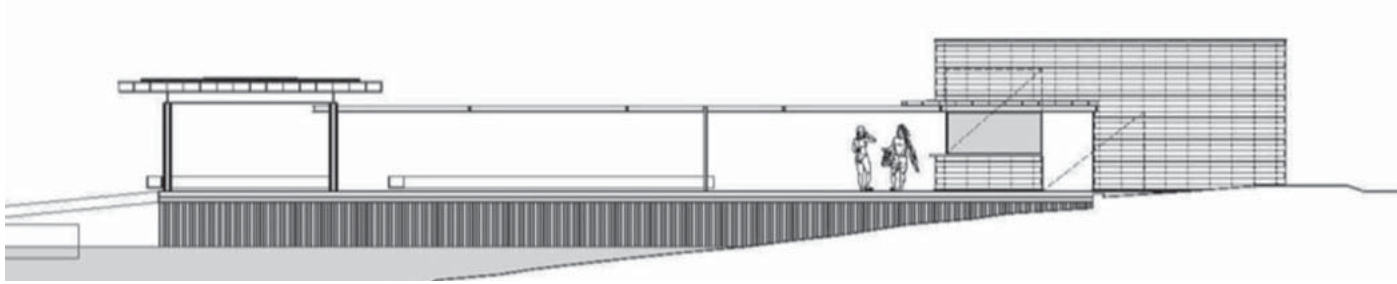
Quotes from the architect:

"Located on one of the many islands dotting The Archipelago in Georgian Bay, Ontario, this private boathouse and docking facility designed by Kevin Weiss of Weiss Architecture & Urbanism Limited exemplifies a quiet and precise modernism. Through careful form-making and the use of rustic materials, the project responds gently both to the natural and cultural context of the area, where historically built-form yields to the power of the landscape with its exposed and glacially carved granite and wind swept jack pines."

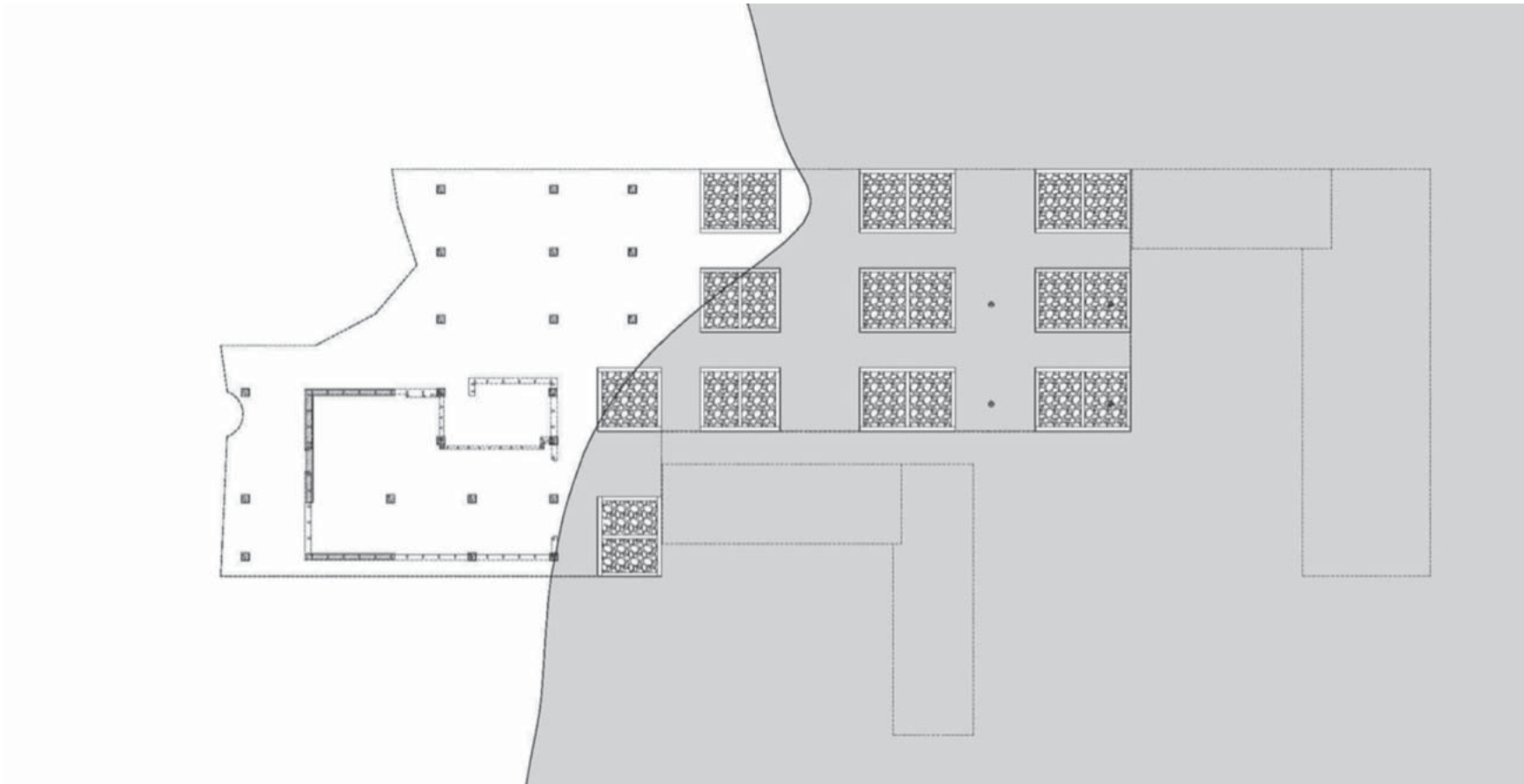
"Sitting on a structure of robust timber and rock cribs, the large cedar dock, and its amenities, is the primary location of the family's daytime leisure activities - both active and reposed. The building elements consists of the cedar dock, floating docks and bridges, a storage building for kayaks, canoes and windsurfing equipment, a food servery, linear shade canopies, and a covered seating pavilion."



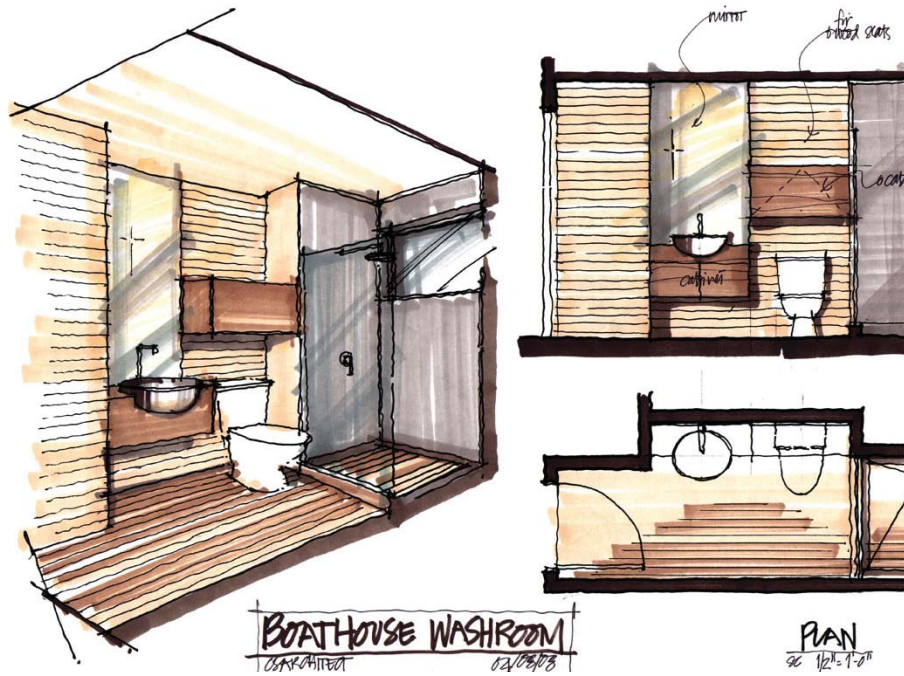




In Conclusion:
This case study proves to be a useful reference based upon its use type, structure and location. The space is designed as an entertainment area with seating and a wet bar which is a similar approach to what my public space will consist of. The building gives off a rustic feel while still having elements associated with an industrial look, much like the building style of many Duluth structures. The structure uses a series of rock cribs supporting columns which would be a viable option for the Duluth boathouse support system beneath the waterline. The last main reason this project works as a good study is the location being set in Canada where temperatures and seasonal changes would be very similar to that of Duluth, MN and Lake Superior specifically.



Muskoka Boathouse



Case Study 2 - Muskoka Boathouse

Architects: Christopher Simmonds Architects

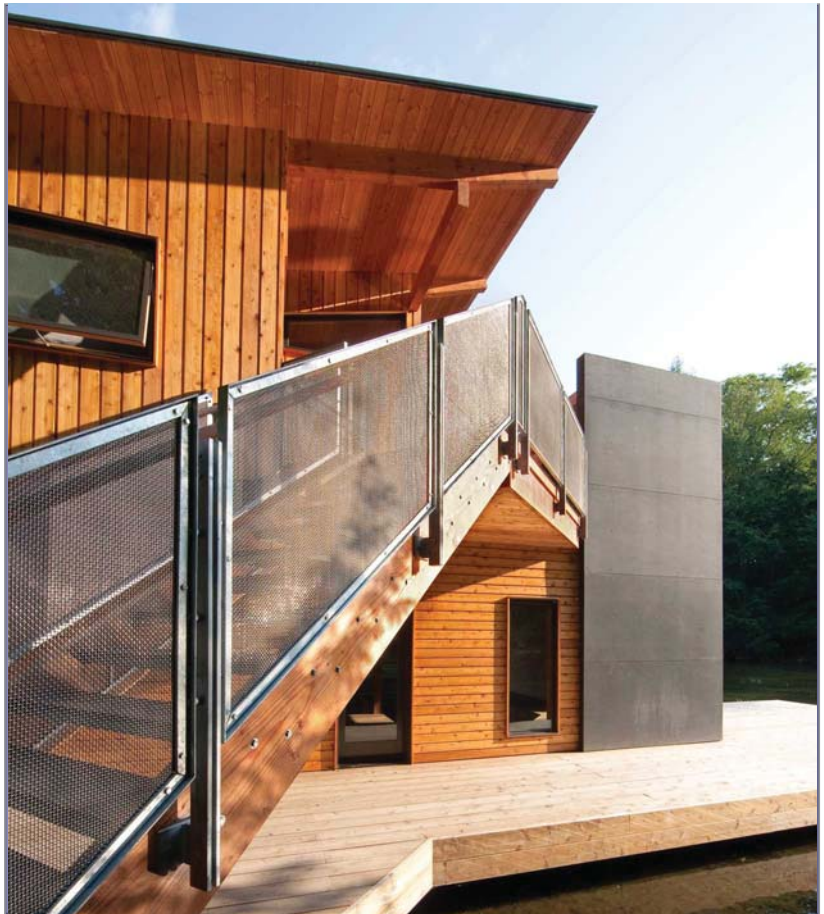
Location: Lake Muskoka, ON, Canada

Architect in Charge: Christopher Simmonds

Project Year: 2007

Structural Engineering: N/A

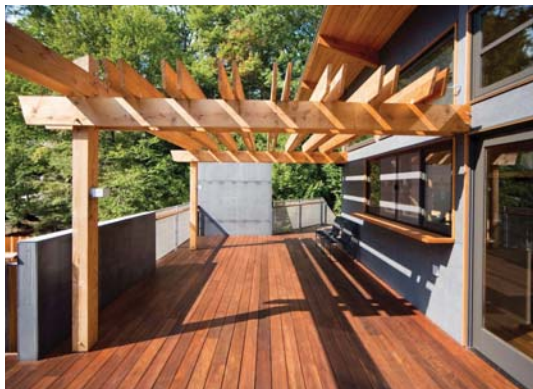
Source: http://www.archdaily.com/204758/muskoka-boathouse-christopher-simmonds-architect#_=_



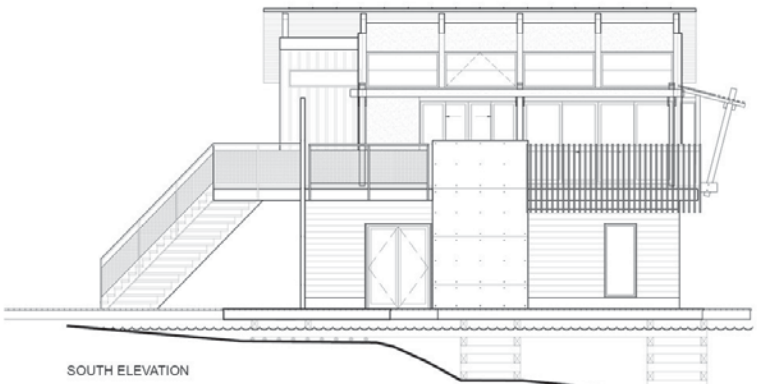
Quotes from the architect:

"This project for the renovation of an existing boathouse and new 600 sq.ft. second storey guest suite is located in the Muskoka Lakes region of Ontario. Situated at the end of a narrow bay, the design of the new boathouse mediates between extended views out to the wide vista of the distant lake and the immediacy of the enclosed forested shoreline of the bay. The design provides a lens for these varied views as well as a sheltering foil to the open lake breezes and water traffic. The project called for the renovation of an existing two slip boathouse and the addition of a second storey guest suite and roof terrace."

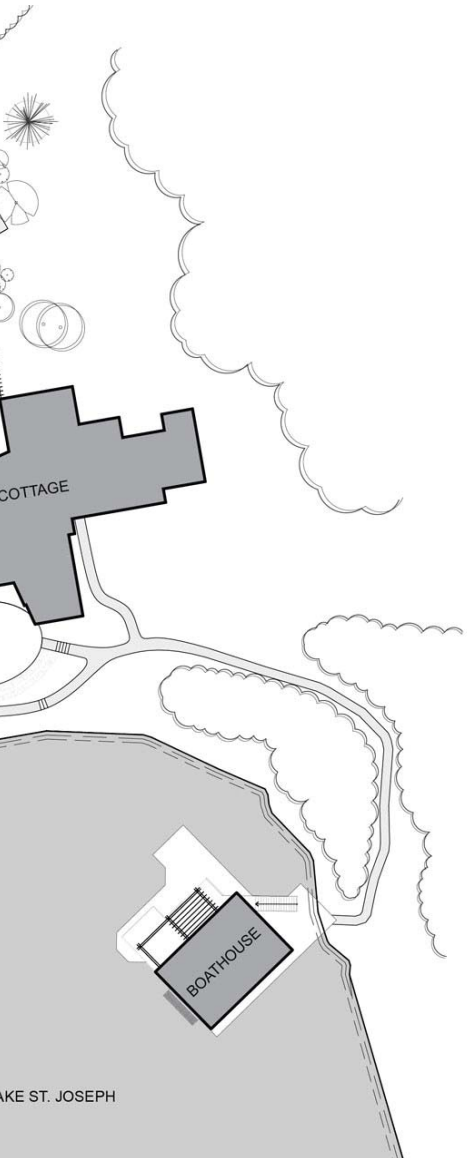
"The exterior cladding of the main volume of the boathouse is clear stained western red cedar, used horizontally on the ground floor and vertically above to define the two programmatic uses for the building. Cement board panels and Douglas Fir screens provide the exterior terrace with privacy. Stair guards are steel framed with a wire mesh infill and add a further nautical level of detail to the overall effect of the design."



EAST ELEVATION



SOUTH ELEVATION



In Conclusion:

The Muskoka project relates well to the Duluth boathouse as it incorporates both indoor and outdoor dock space for boaters which will be a key element to the Duluth marina. Though the scale is much smaller than the Duluth design will be, the concepts and design features used include the industrial meets rustic cabin look that the Lake Superior area is known for. Another feature that makes this project a nice reference is the site plan and the juxtaposition of the buildings in a campus style layout. The material use and structure design within the boathouse can be used for the Duluth project since they have served this one well even though it is in a northern climate. This design experiences freeze thaw and still holds strong while keeping the rustic feel, therefor several of the features in this design can prove to be an effective influence on the completed Duluth design.

Lake Joseph Boathouse

Case Study 3 - Lake Joseph Boathouse

Architects: Altius Architecture Inc.

Location: Parry Sound District, ON, Canada

Architect in Charge: N/A

Project Year: 2012

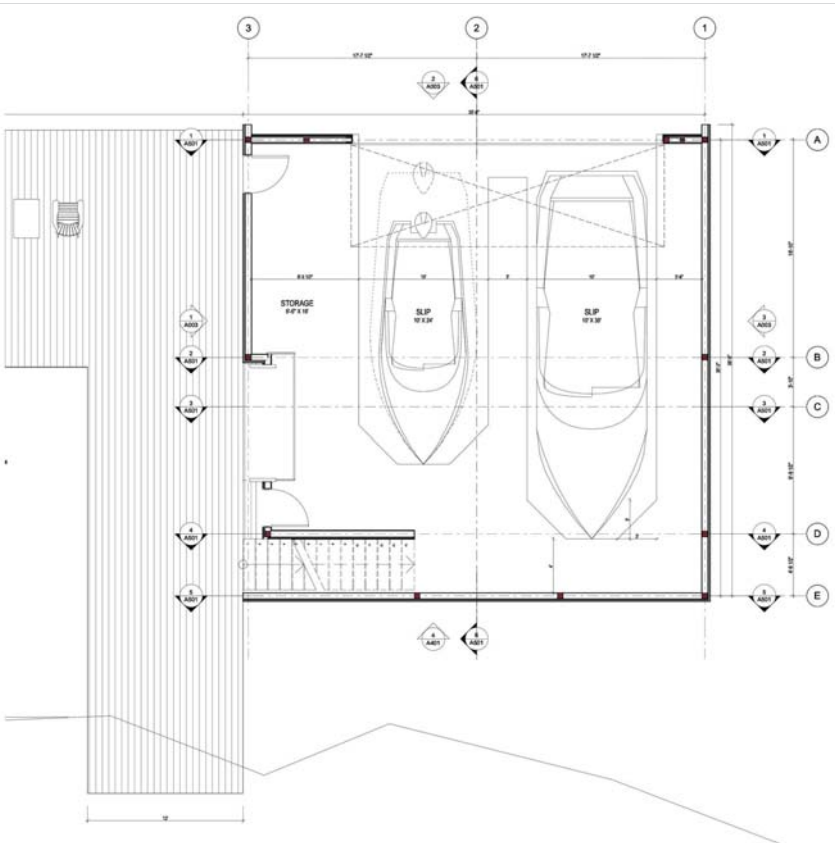
Structural Engineering: N/A

Source: http://architizer.com/projects/lake-joseph-boathouse/

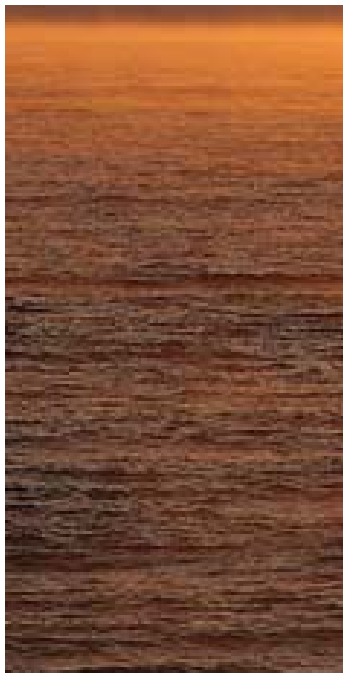
Quotes from the architect:
"The design of this boathouse, on the shore of Lake Joseph, is driven by stringent guidelines prescribed in the zoning by-laws. The project carves into the pitched roof tradition of the area and extends views out towards the lake, taking a modern twist on the established building typology. This starting point sparked an iterative design process involving building orientation, openings, sunlight and materiality, to negotiate a number of factors in the design of a simple dwelling with dynamic spatial qualities. In a site-specific approach, views are directed towards desired locations along the lake while adding headroom for the programmatic functions beneath the pitched roof."

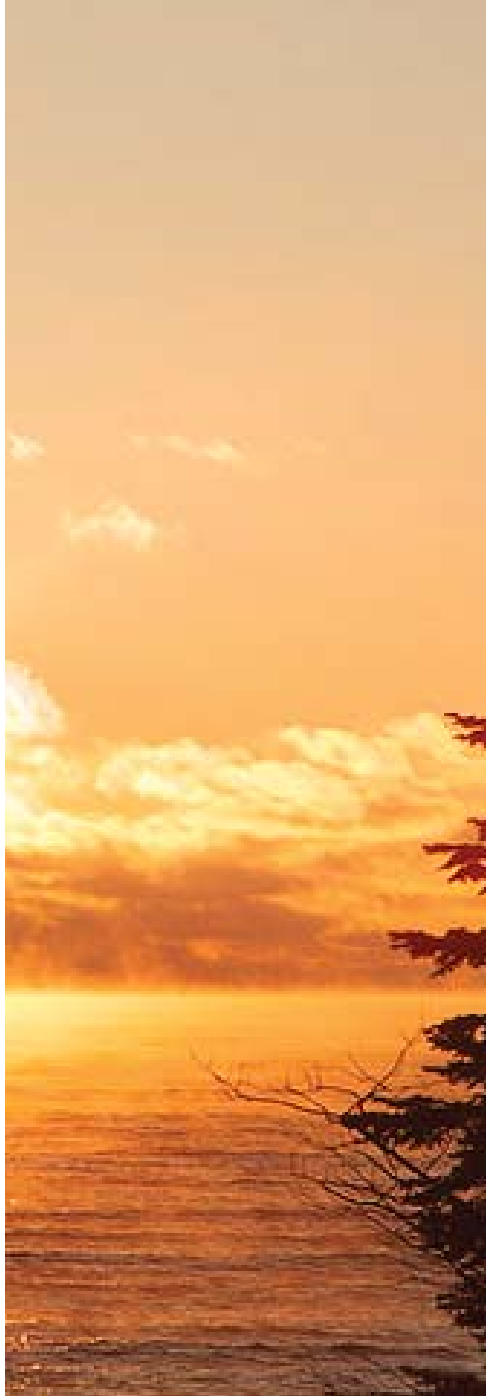
"Elements of addition in the rectangular dormers allow the boathouse to inhabit the maximum building area, while balanced with an element of subtraction in the second floor deck. This outdoor space, carved out of the roof, is an extension of the interior living area, where the dwelling is perceived to be larger than zoning by-law will allow. The elevations are designed as a wrapping of material integrating openings and cut outs of contrasting material, adding to the dialogue between building elements."

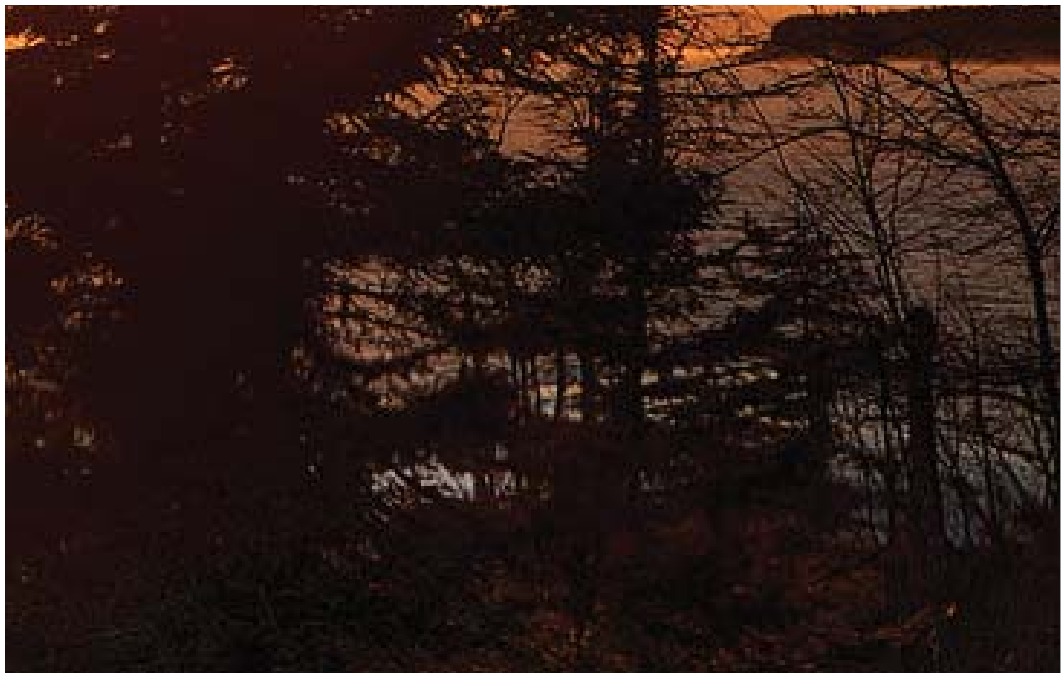
In Conclusion:
Much like the Maskoka project the Lake Joseph Boathouse is a visually pleasing mix of modern industrial design with rustic aspects and materials throughout all placed on a site that is subject to freeze thaw. A unique reason that this project is found to be relatable to the Duluth concept is the solution to the dramatic elevation change as to approach the building from the shoreline. Much like the site of the marina this project was forced to cope with a change in elevation that influenced the design in a positive way. A key feature that can be taken away from this design is the custom sized boat slips within the garage space. This is a smart practice because by knowing more about the clients and the boats they may drive can aggressively alter the end floor plan of a boat house or marina. The cosmetic design of the exterior proves to be attractive as it takes basic garage style architecture and utilizes addition and subtraction with contrast of wood and composite materials to create something unique to the area while still feeling familiar. This is exactly the feeling that the Duluth boathouse is aiming to achieve for the shoreline of Lake Superior


STORAGE
SLIP
SLIP


DECK
LIVING ROOM
BATHROOM
SHOWER
BEDROOM
UTILITY
OPEN TO BELOW







The Problem Statement /Program

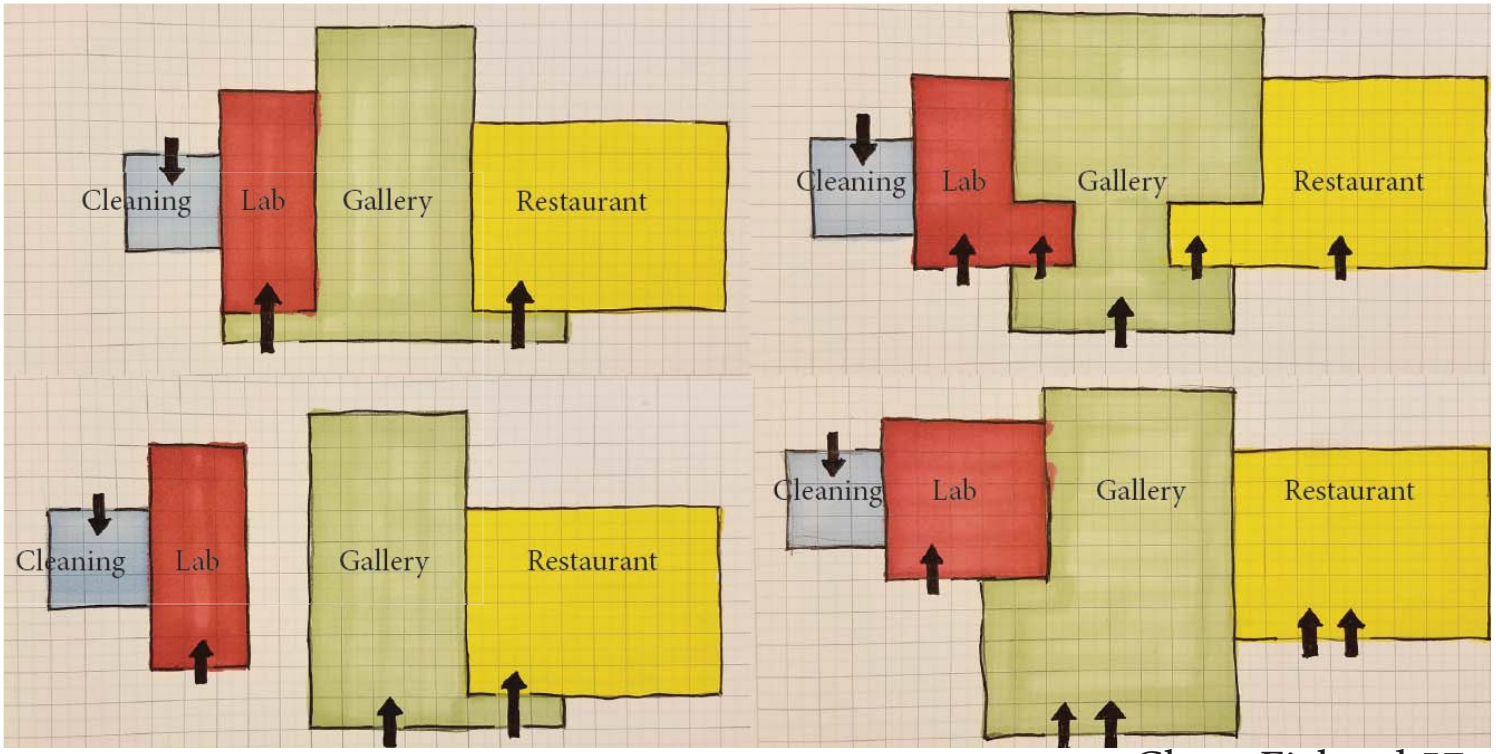
Function...

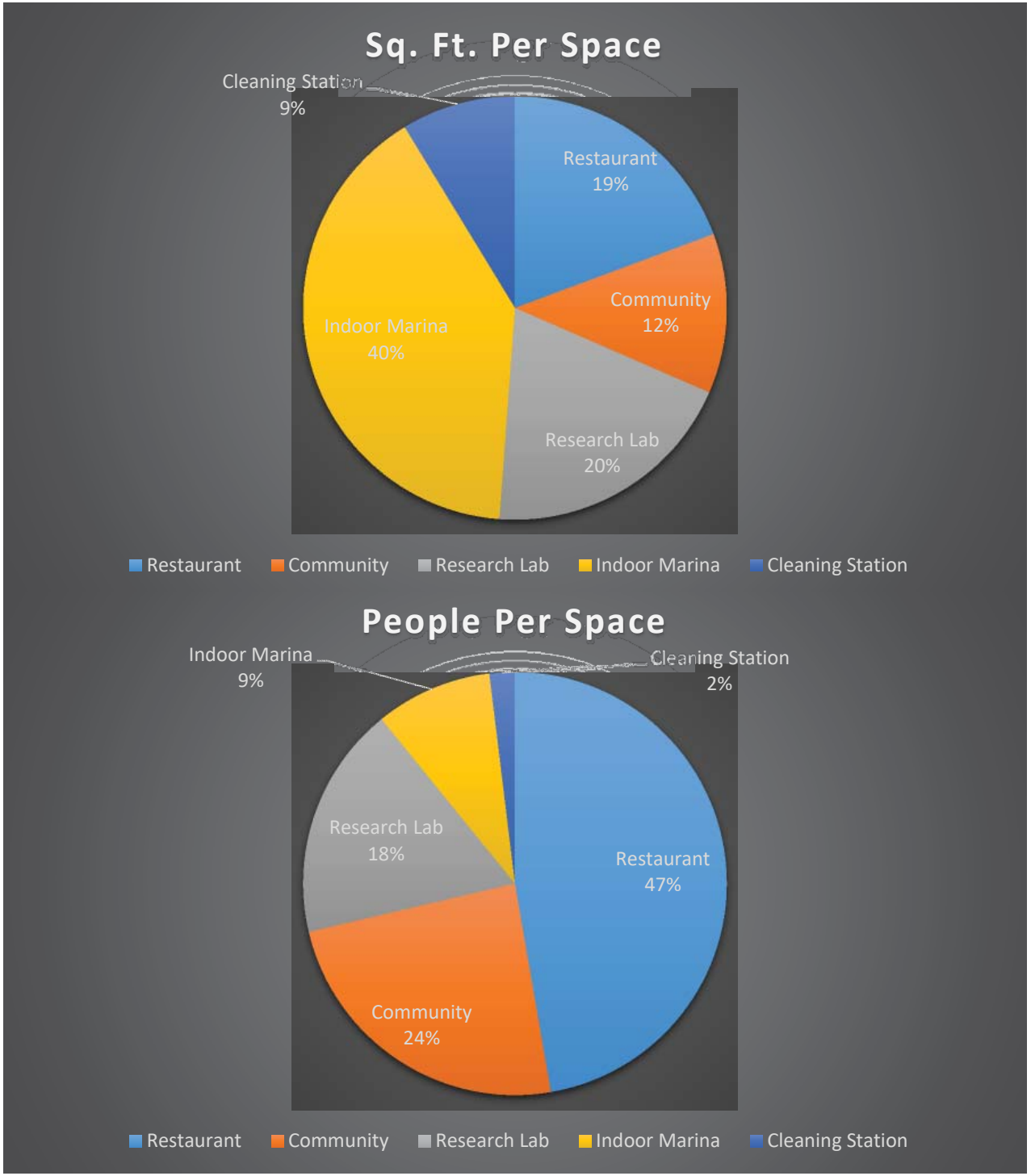
The function of the building needs to resemble that of a machine. Meaning that each piece needs to serve its purpose with utmost efficiency due to the lack of buildable area. The space is divided into three main components and two minor additions. The three main pieces involve the restaurant area, the community educational gallery and the research lab for the university. The two additional spaces include the boat washing station for exiting seafarers and the marina area at water level. The restaurant space needs an approachable entrance linked with the gallery space to provide a cohesive dining experience for visitors and locals. The goal is for folks to enjoy the more relaxed recreational end of the project after work or a day on the lake. This involves elaborate landscaping, views to the lake and an open concept feel.

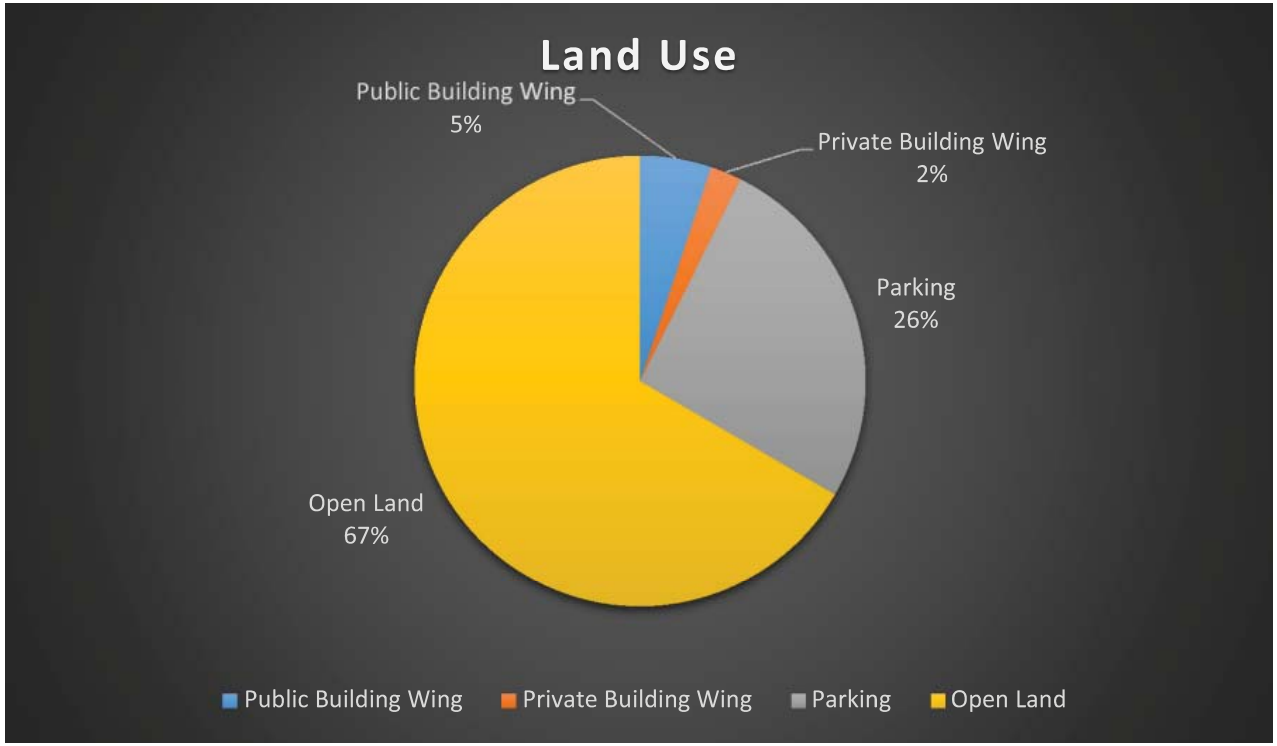
The gallery space is to be very welcoming for groups of tourists or K-12 classes to come and learn so it needs open spaces with display areas and views to the lake and lab. Unlike the gallery and restaurant spaces the lab needs to have a balance between showing off their work and the privacy needed to conduct experiments as well as teach classes for the university. This requires two entries, one for the gallery to let visitors tour and one for the space as a separate entity itself when discretion is needed. The additional spaces are to be able to function fully on their own without any aid from the three main spaces as boaters have to have access no matter what time of day.

Form

The form of the building will be predominantly determined by the function of the spaces within to ensure efficiency. The use is divided into both public and private uses so the form will be inclusive to fit the needs of all three spaces while still performing at a high level. A driving factor behind the use of the space within the building is the fact that half of the building will be place on the water so the base must be robust in order to handle the yearly conditions. To top off the influential factors guiding the form of the building one lust take a look at the surrounding architecture near the building and along the shoreline. Most of these buildings are high end residential and single family homes. This means that the building and site must live up to the same level of class to satisfy the desires of the neighborhood.




Sq. Ft. Per Space
Cleaning Station
9%
Restaurant
19%
Community
12%
Indoor Marina
40%
Research Lab
20%
Restaurant
Community
Research Lab
Indoor Marina
Cleaning Station
People Per Space
Indoor Marina
9%
Cleaning Station
2%
Research Lab
18%
Restaurant
47%
Community
24%
Restaurant
Community
Research Lab
Indoor Marina
Cleaning Station



Economy

Though high end low profile designs don't usually occur in public state funded gallery spaces, they do however occur in restaurants. The lab will be funded by the university and the money earned by the lakeshore restaurant will help offset the costs to keep the gallery open. Smart design and planning usually mean spending money in the right places now so that you get a proper return on investment in the future. This notion will be the driving factor pulling the economy of the project along far beyond its completion. With a wise choice in materials along with energy harvesting strategies incorporated into this design, it will begin paying itself off within the first decade or so after the ribbon cutting.

Time

With the large impact that the lake life has on the city of Duluth a facility such as this is likely to grow in popularity as time passes. The harbors closer to downtown are becoming overcrowded and the commute is impractical for the thousands of Lakeside residents in the area. Not only would this marina be likely to sustain its users and grow but the restaurant with a bar would be a dramatic change to the area. The ban on alcohol sales was removed in the last two years leaving an open market for anyone willing to start a bar / restaurant type business in this neighborhood. To be the first establishment to serve alcohol in the area as well as being the first marina would create a dominating monopoly effect necessary to hold down this particular market for many years to come.

Building Area		Phase 1					
Space Name		People	Capacity	Unit	Net Area	Net:Gross	Gross Building Area
Restaurant							
	Deck Space	30	30	N/A	450	0.5	900
	Dining	60	60	N/A	900	0.5	1800
	Bar Area	25	25	N/A	375	0.5	750
	Storage	1	1	N/A	300	0.5	600
	Kitchen	5	5	N/A	1000	0.5	2000
	Mechanical	1	1	N/A	300	0.5	600
	Subtotal	122					6650
Community							
	Gallery	40	40	N/A	1200	0.5	2400
	Public Restroom	TBD	TBD	N/A			
	Deck Space	20	20	N/A	300	0.5	600
	Storage	1	1	N/A	300	0.5	600
	Mechanical	1	1	N/A	300	0.5	600
	Subtotal	62					4200
Research Lab							
	Restroom	TBD	TBD				
	Conference	12	12	N/A	180	0.5	320
	Mechanical	1	1	N/A	300	0.5	600
	Office	10	10	N/A	1000	0.5	200
	Lab Space	10	10	N/A	500	0.5	1000
	Storage	1	1	N/A	300	0.5	600
	Loading Dock	2	2	N/A	600	0.5	1200
	Locker Room	10	10	N/A	500	0.5	1000
	Subtotal	46					4920
Indoor Marina							
	Boat Garage	20	20	N/A	6000	0.5	12000
	Storage	2	2	N/A	600	0.5	1200
	Mechanical	1	1	N/A	300	0.5	600
	Subtotal	23					13800
Cleaning Station							
	Cleaning Space	4	4	N/A	1200	0.5	2400
	Vestibule	TBD	TBD	N/A	TBD		
	Mechanical	1	1	N/A	300	0.5	600
	Subtotal	5					3000
	Total:	258					32570

Displayed here are the spreadsheets for both the spaces and the areas for the project. These will set the base standards during the preliminary design phase in developing the project. Though they will serve mainly as a base to draw from the ratios shown here will remain relatively the same through to the end of the project design and layout. Paired with the charts on the previous two pages these visuals give a strong overview as to the basic goals and needs for the boathouse design along with its support spaces and secondary elements.

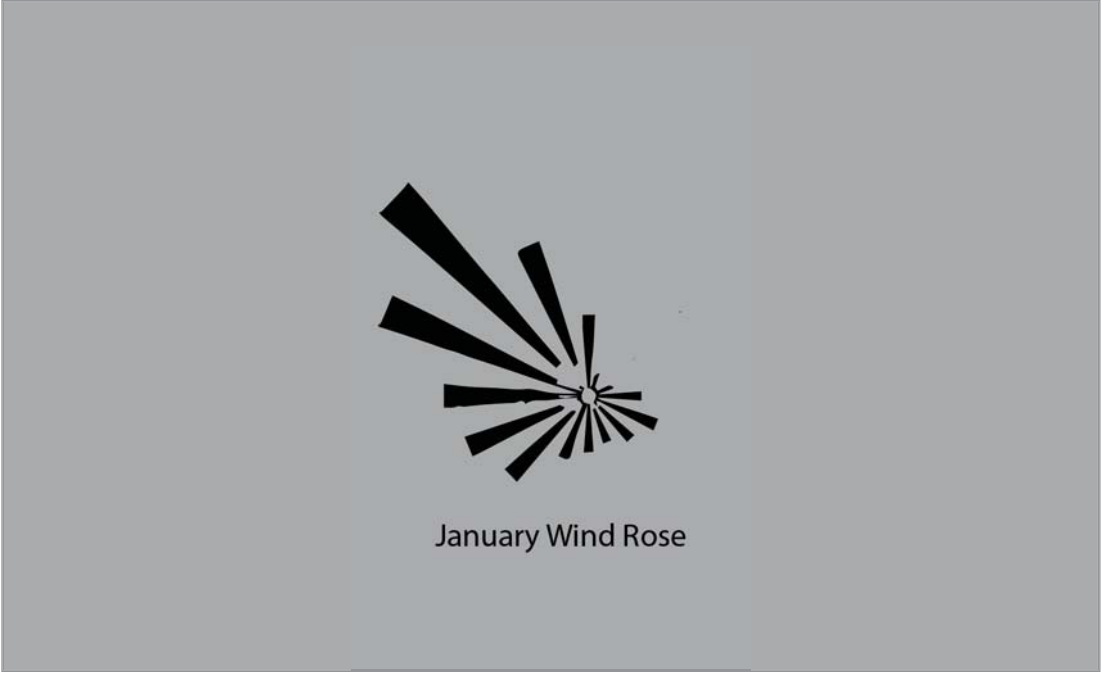
Space List								
	Function	People	Capacity	Unit	No. of Units	Area/Unit	Net Area	Net Area Subtotal
Restaurant								
	Deck Space	30	30		1	450	450	
	Dining	60	60		1	900	900	
	Bar Area	25	25		1	375	375	
	Storage	1	1		1	300	300	
	Kitchen	5	5		1	1000	1000	
	Mechanical	1	1		1	300	300	
	Subtotal	122						3325
Community								
	Gallery	40	40		1	1200	1200	
	Public Restroom	TBD	TBD		2			
	Deck Space	20	20		1	300	300	
	Storage	1	1		1	300	300	
	Mechanical	1	1		1	300	300	
	Subtotal	62						2100
Research Lab								
	Restroom	TBD	TBD		2			
	Conference	12	12		1	180	180	
	Mechanical	1	1		1	300	300	
	Office	10	10		1	1000	1000	
	Lab Space	10	10		1	500	500	
	Storage	1	1		1	300	300	
	Loading Dock	2	2		1	600	600	
	Locker Room	10	10		1	500	500	
	Subtotal	46						3380
Indoor Marina								
	Boat Garage	20	20		1	6000	6000	
	Storage	2	2		1	600	600	
	Mechanical	1	1		1	300	300	
	Subtotal	23						6900
Cleaning Station								
	Cleaning Space	4	4		1	1200	1200	
	Vestibule	TBD	TBD		2	TBD		
	Mechanical	1	1		1	300	300	
	Subtotal	5						1500
	Total:	258	258					17205

Site Analysis

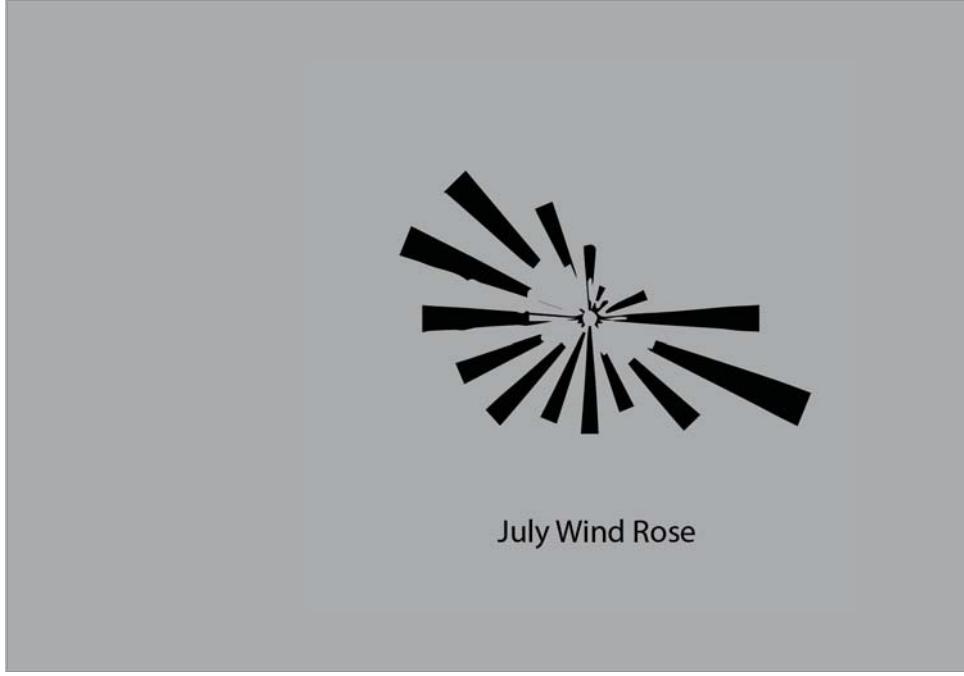
As previously stated...

The building as a whole will be placed on a site in the Lake Superior port city of Duluth Minnesota. Just as the city limits end on the north shore of town is the Lester River which runs into Lake Superior. This will be the intersection on which the boat house, marina and its supporting facilities will sit. The reasoning behind using Lake Superior as a host is that it would prove to be the ultimate test for a redesign of the boat house concept. With hurricane force winds, 20 foot swells and moving winter ice that can bend steel, the lake would help display the true strength behind the architecture of the project. In 2010 there was a wind storm on Lake Superior that could match the requirements for DADE County Wind specification for Florida's hurricane zones. Waves rose 12 feet in 2 hours reaching 25 foot swells and the Indiana Harbor reported instantaneous winds of 144 mph (US Department of Commerce, n.d.). A structure design that is capable of dealing with these types of conditions would be bullet proof on smaller Minnesotan lakes. This creates another opportunity for the building to stand as an example for correct lakeshore construction that will last through our seasonal changes without crumbling years down the road.


KNIFE RIVER SAFE HARBOR
MCQUADE SAFE HARBOR
PROJECT SITE
DULUTH HARBOR
E SUPERIOR ST
N 68TH AVE E
LESTER RIVER
CONGDON BLVD
LONDON RD
SITE
N



January Wind Rose



July Wind Rose

Another driving factor in choosing this particular site is safety. An issue with Lake Superior is that with the large hill all along the north shore it can be hard to tell when nasty weather is approaching. To keep sea farers out of harm's way, there are safe harbors every 7 miles or so along the shore. The problem is that there happens to be a gap of 11 miles between downtown Duluth and the next safe harbor. ("Division of Ecological and Water Resources: Water Publications and Presentations: Minnesota DNR," n.d.)

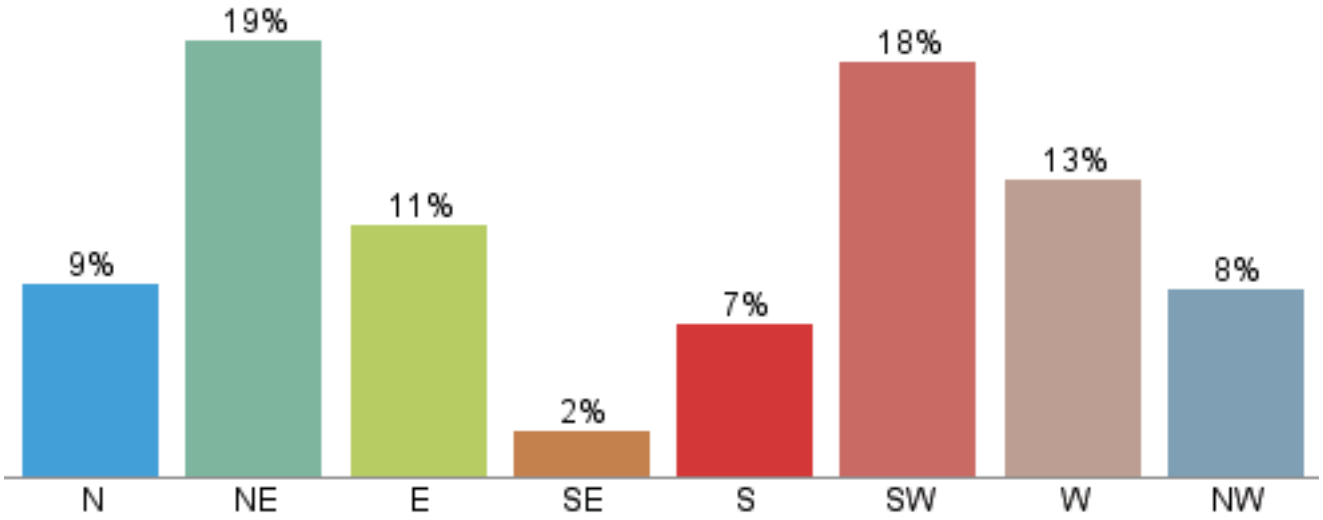
With the large population of Duluth, there is need for an extra safe harbor in between the current ones near the city, which will better serve the heavier boat traffic. This halfway point happens to be just a mile away from the chosen site making it the right place for the safe harbor that connects directly with the project. Safe harbors on this lake are usually a buildup of rock around the marina to break both large waves and damaging ice in the winter. The rock features not only create an opportunity for unique landscaping but help to protect the building and its components.

A key factor in choosing the site for this project is the fact that a section within the building is designated as a water research space. This means that having the river and the lake close by for people to monitor will be a huge convenience. With this combination being within the city limits it makes the research space very attractive to local businesses and colleges.

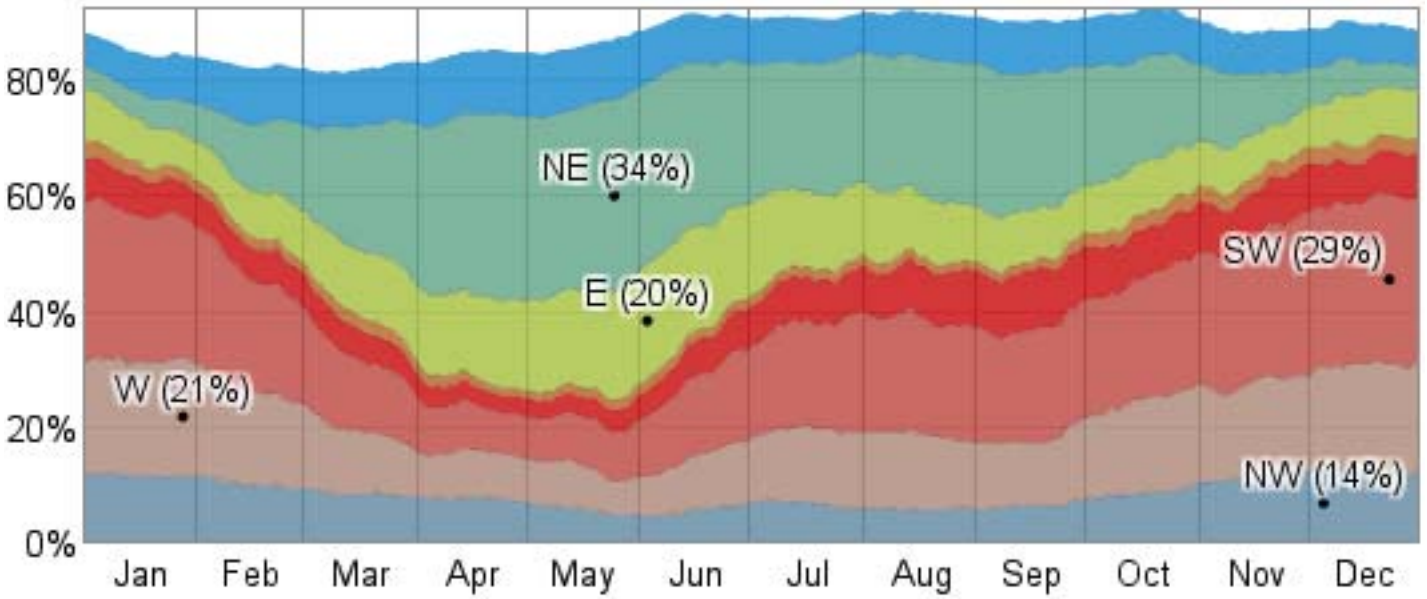
In regards to site evaluation for this project, a large factor to look into is soil conditions for the foundation. Since the building will be designed to withstand the forces of the lake waves, ice and wind, the foundation must be adequate. Luckily the site sits on an area of Minnesota shoreline that is primarily Basalt bedrock. This soil type is considered in the Material Class table of the building code as a 1a classification, which is the best possibility. Class 1a soils can allow for 100 tons per square foot bearing pressure. This means that large spread out footings can be avoided making the structures impact on the site minimal.


SITE

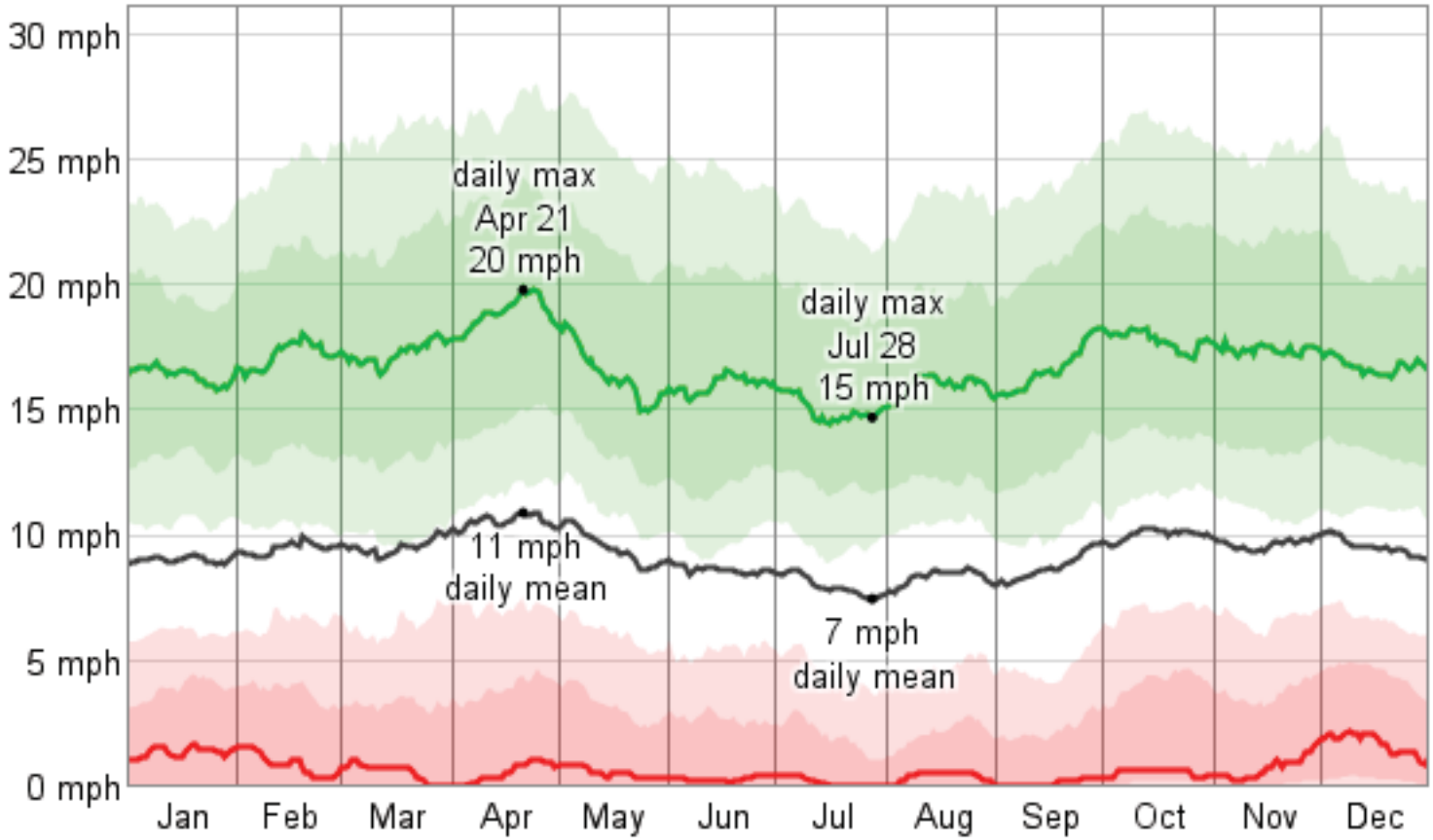
Wind Directions During the Year



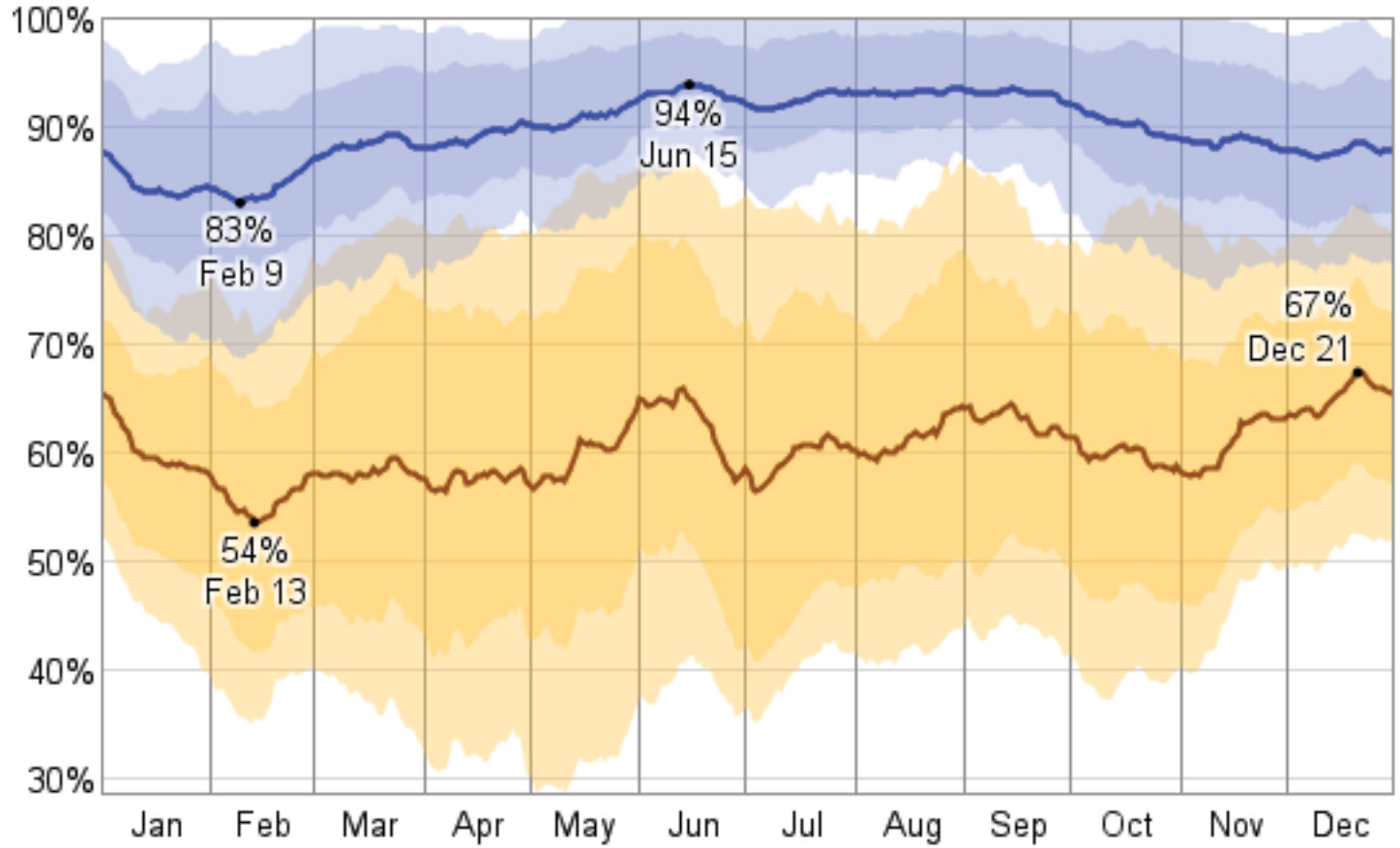
Time Spent with Various Wind Directions During the Year

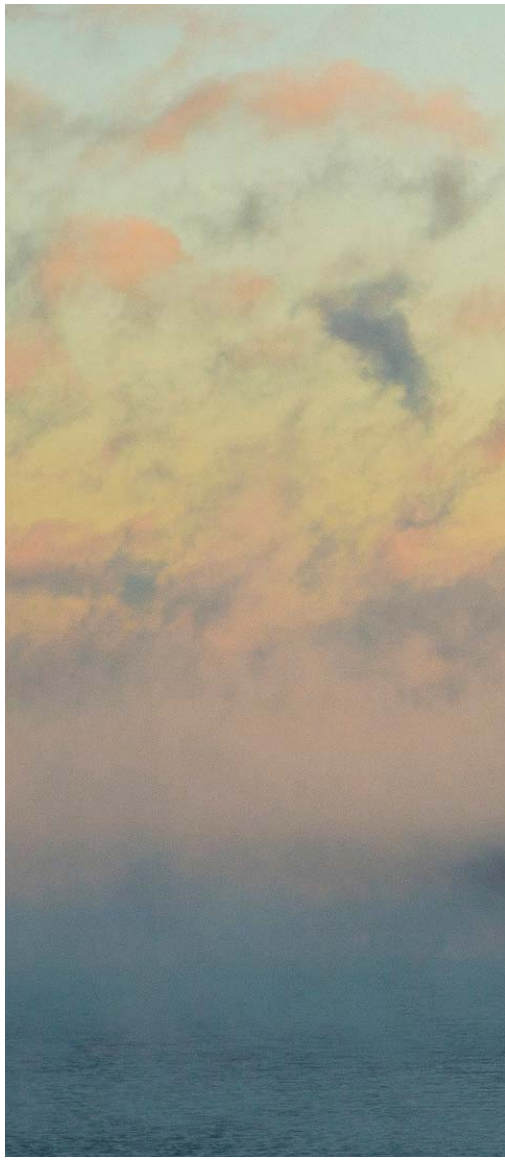


Wind Speed During the Year

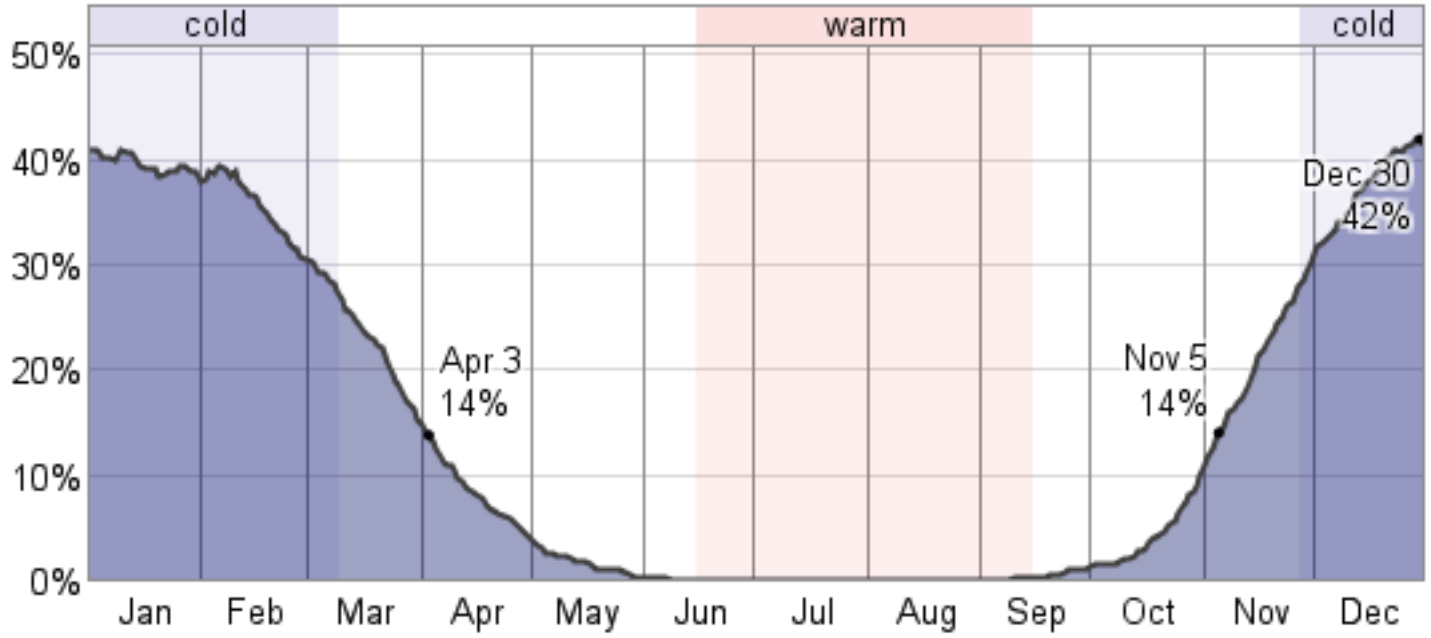


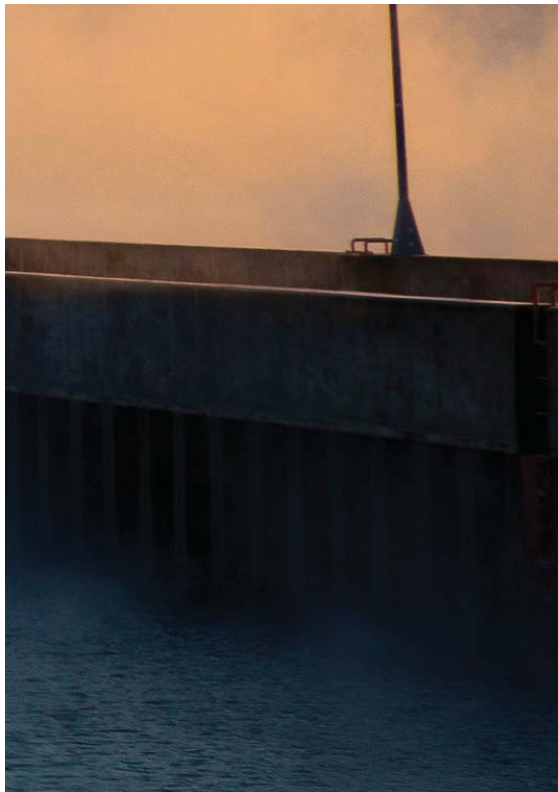
Relative Humidity

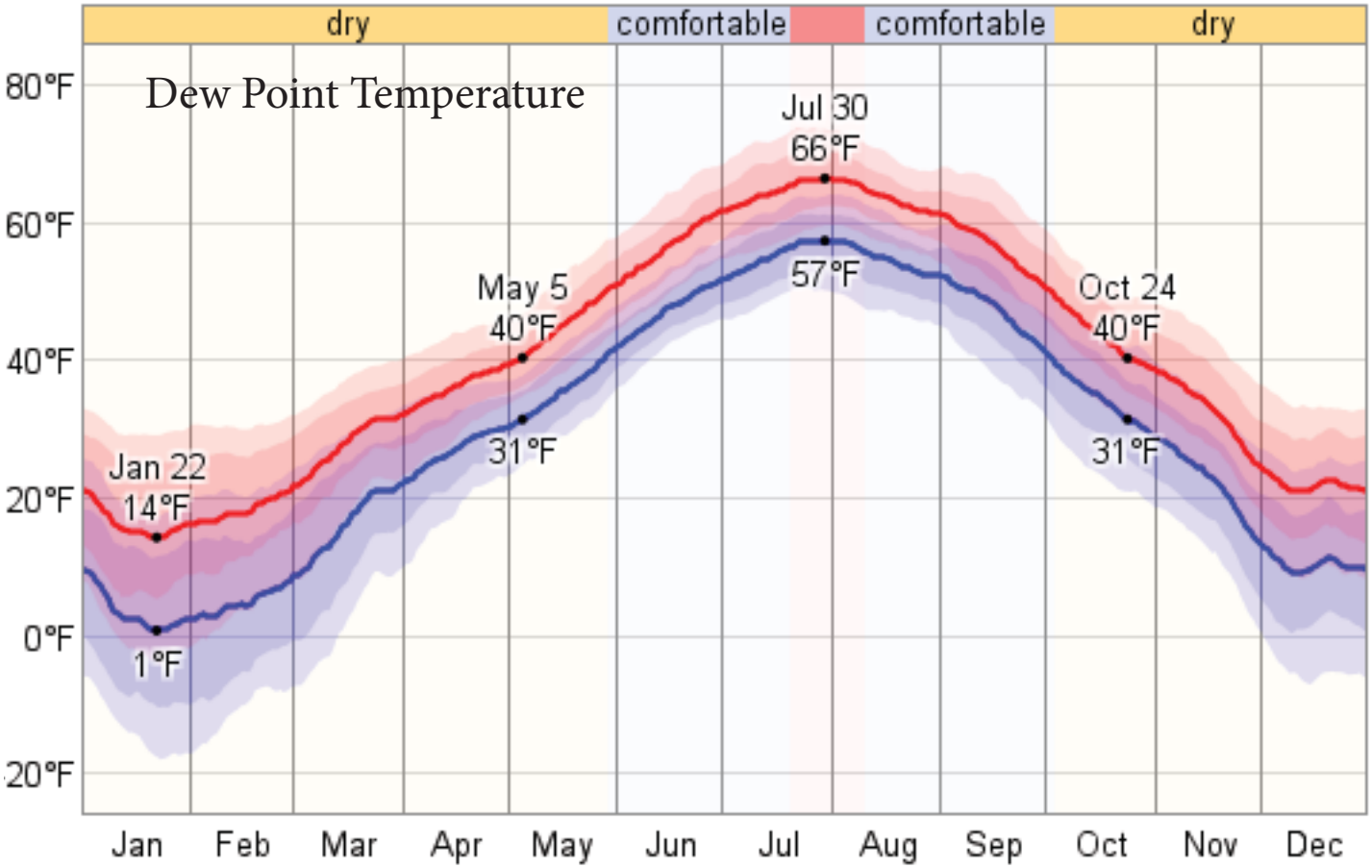




Probability of Snow Fall






dry
comfortable
comfortable
dry
Dew Point Temperature
80°F
60°F
40°F
20°F
0°F
20°F
Jul 30
66°F
57°F
May 5
40°F
31°F
Oct 24
40°F
31°F
Jan 22
14°F
1°F
Jan
Feb
Mar
Apr
May
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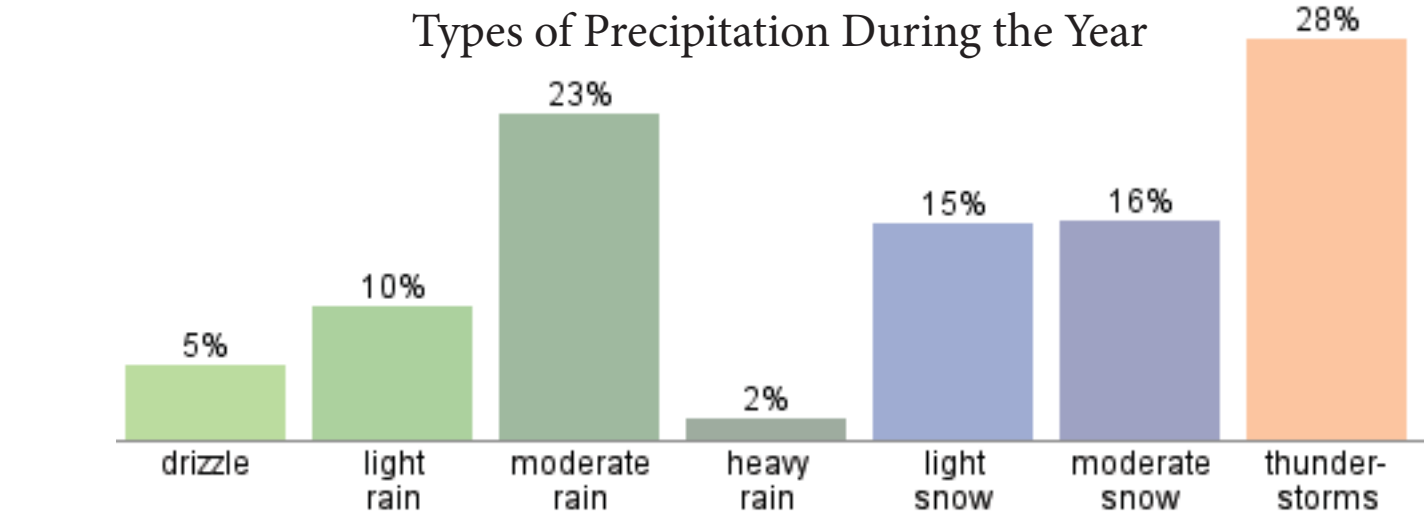
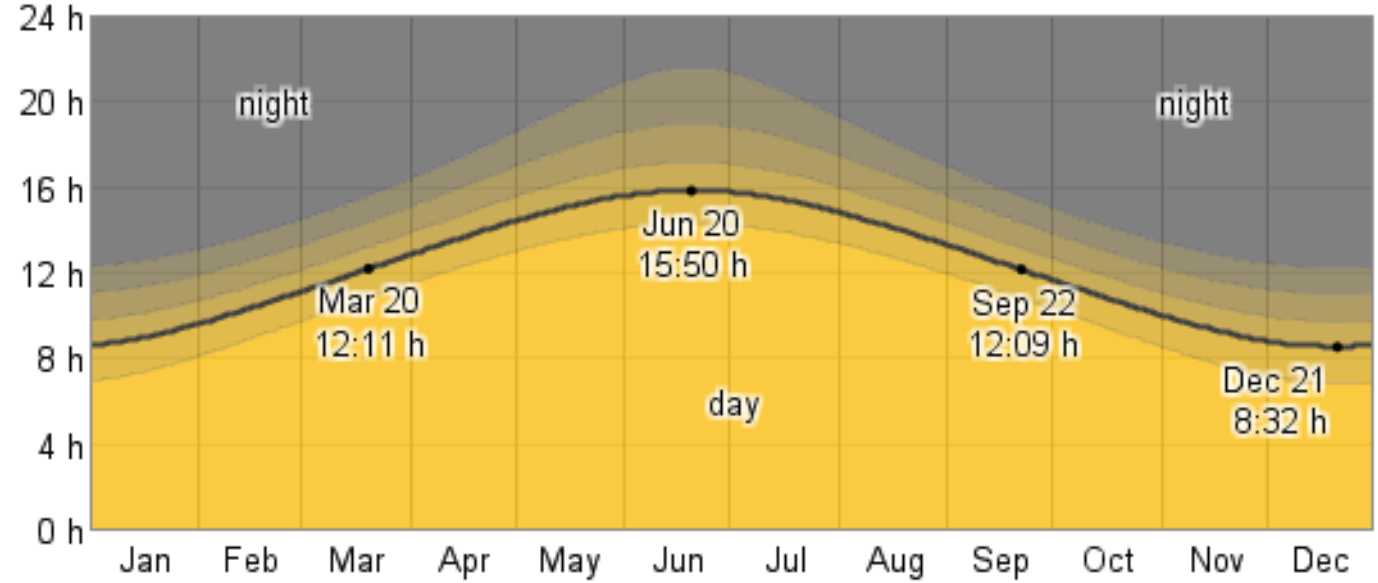
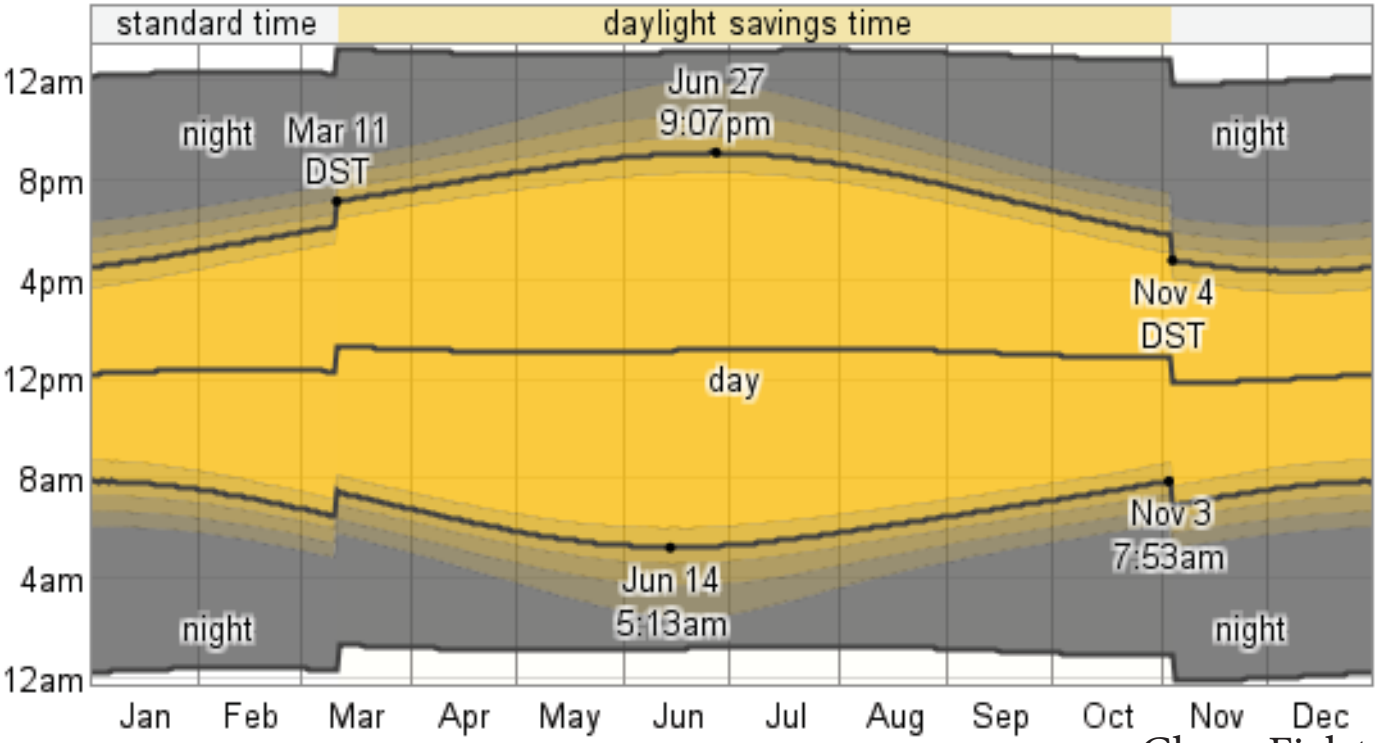
Jul
Aug
Sep
Oct
Nov
Dec


Types of Precipitation During the Year
5%
10%
23%
2%
15%
16%
28%
drizzle
light rain
moderate rain
heavy rain
light snow
moderate snow
thunder-storms

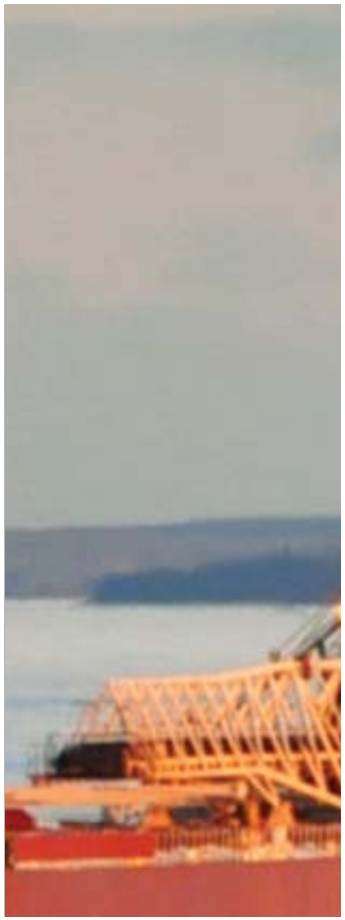
Daily Hours of Daylight and Twilight Hours



Sunrise / Sunset with Daylight Saving Time



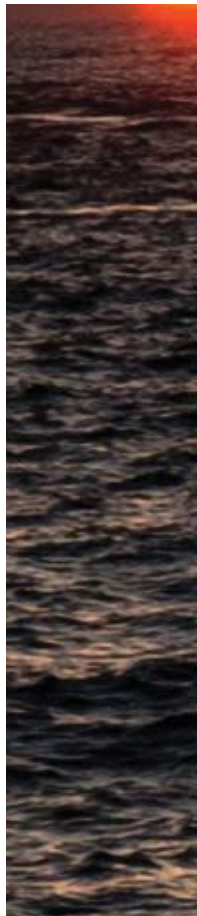

GREAT LAKES TRADER



Chase Fjelstad 75

Code Analysis

Code Analysis…



The building will be designed using primarily heavy timber construction in order to fit the aesthetics of the area as well as the architectural type. The only exception will be portions of the boat garage area at the water level. This area will have various poured in place concrete features to hold back the world under the main building above. As for the occupancy type A-3 was chosen based upon its flexibility in which types of spaces fall into the category, so although it is a mixed use building, the main portion at street level will be all A-3. As for the spaces connecting to the building such as the cleaning station and the spaces below the building such as the boat storage area, those will have to be determined once the design process is well under way. As the design currently sits, it is well within the limits of the A-3 requirements and limitations to meet code for this style of occupancy.

The real code issues arise when talking about the main premise behind the thesis, which is a boathouse. Since boathouses are not allowed in Minnesota, this project will, in a way, have to adopt codes or regulations from states or countries (Canada) that do allow for this style of architecture. These codes will then have to be altered to fit the current ones in place for Minnesota so that each will mesh with one another, creating a special code for this type of project specifically. Material uses will play a large role in determining the code requirements for a sustainable and minimally harmful boathouse design. Codes are one of the main conflicts for the design so the way they are handled will go hand in hand with the end product itself.

Main factors to keep in mind during design phase:

- Material Use
- Canadian Code Adoption
- Regulations on Foundation Designs
- Upkeep Recommendations / Requirements
- Construction Administration Regarding Pollutants

Code Analysis Path...

Building Type: Type IV Heavy Timber

Occupancy Type: A-3
Assembly:
-Exhibit gallery & museum space - 30 net
-Table & chairs – 15 net
-Average - 22 net

Allowable Area: 60,000 Sq. Ft. when sprinkled

Allowable Occupant Load: 2,727

Allowable Height: 85 Ft

Allowable Stories: 4 when sprinkled

Fire Resistance Rating: 2 Hr Exterior walls, 1 Hr Interior walls

Exit Access Travel Distance: 250 Ft when sprinkled

Exit Door Width:
2,727 x 0.2 = 545.4 / 12” = 45.45 / 3’ = 15 Exit Doors

Canadain Boathouse Regulations to be adopted for project... (guidlines set by Fisheries and Oceans Canada or "DFO" @ www.gov.mc.ca)

- Building permit required to build boathouse
- Usually requires structural engineer to sign off
- Work permit required if more than 15 square metres of cribbing under structure

DFO review is not required if a project meet conditions such as:

• you are not working within West Hawk Lake, which is subject to provincial management consideration,
• it is a new, repair or rebuild of a floating, cantilever or post dock or boathouse,
• it is a new, repair or rebuild of an open-faced crib dock or boathouse built entirely on natural bedrock or sand bottom with a total combined footprint (for both existing and proposed cribs) of 15 square metres (161 ft2) or less,
• the total surface area for the entire dock and boathouse, which occurs in a location below the ordinary high water mark (HWM) (see definition below), including both existing and proposed structures combined, does not exceed 50m2 (538 ft2), unless the structure is built entirely over natural bedrock or sand bottom (not supporting aquatic vegetation),
• it is not made of concrete or steel sheeting or any other skirting that isolates the inside of the crib from the rest of water,
• it does not require any dredging, blasting or infilling in the water body,
• the combined width for all existing and proposed shore beaches) is less than 25% of the property's riparian area width (shoreline frontage width),
• you incorporate the Measures to Protect Fish and Fish Habitat when Building your Dock and Boathouse listed below in this Operational Statement.

Other measures taken to protect wildlife in the Canadian Boathouse building requirements include:

Using existing trials and access when possible

Keep vegetations removal to a minimum

Posts and rails to support for boat access can be used anytime

Create cribs using large rocks to make spaces for wildlife to inhabit

If rocks or stumps need to be removed, place in similar area and similar depth in water to avoid disturbance

Use untreated or harsh chemical free materials

Cut and stain materials away from shoreline

Construct using barges instead of shoreline machinery

Concrete must be precast and cured away from HWM (High Water Mark)

Vegetate disturbed areas with native seeds and trees

Avoid doing work during wet and rainy periods

Construct from ice when possible to avoid shoreline damage

Construction above HWM is highly encourages to minimize habitat disturbance

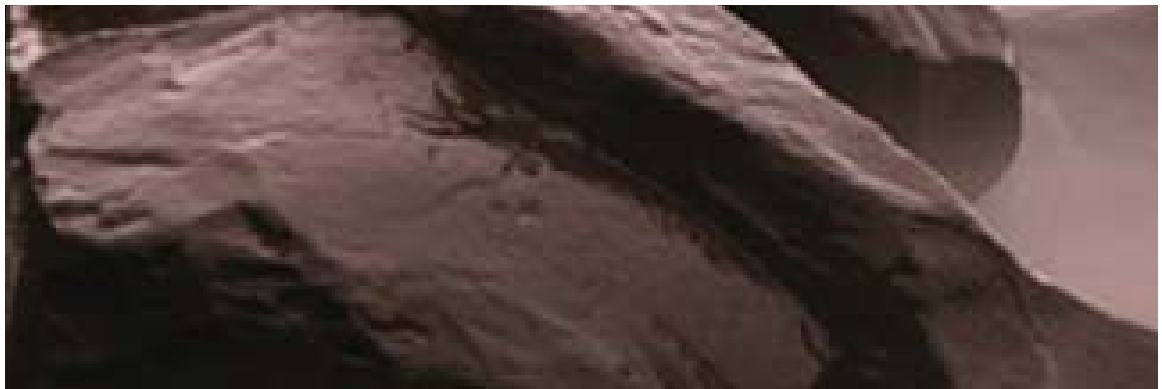
Time installation of cribs to avoid disruption of sensitive fish life stages

Maintain effective erosion control until replanting is performed at the end of the project

Keep construction machinery clean and do not allow for fluid leaks

Keep emergency spill kit on site in case of machinery malfunction

Restore any backs to original condition when finished



Plan for Proceeding

Plan For Design Methodology...

The system or process that is to be used during the development of the project will be a direct result of the solutions given for each of the obstacles previously mentioned. This means that a series of questions regarding the layout and structure of the project need to be asked with several potential solutions in mind. Each of these given solutions are to be weighed as to how well they serve the people, the environment and the area as a whole. Once the most appropriate answer has been selected for each issue, the design will slowly piece itself together.

Plan For Documentation...

Closely related to the design methodology is the design process plan documentation. The documentation of the development progress will be compiled on a bi weekly basis with a summary as to what has been accomplished as well as the next terms goals. Each month will be divided into two halfs resulting in 6-7 hard deadlione dates throughout the semester. This will allow for an accelerated view into how the end design has emerged once the project is complete. The documentation will be more intense during the first half of the semester as it will be more research driven design. The second half of the semester will be less so as it will consist of experimental production and final design phase type tasks.

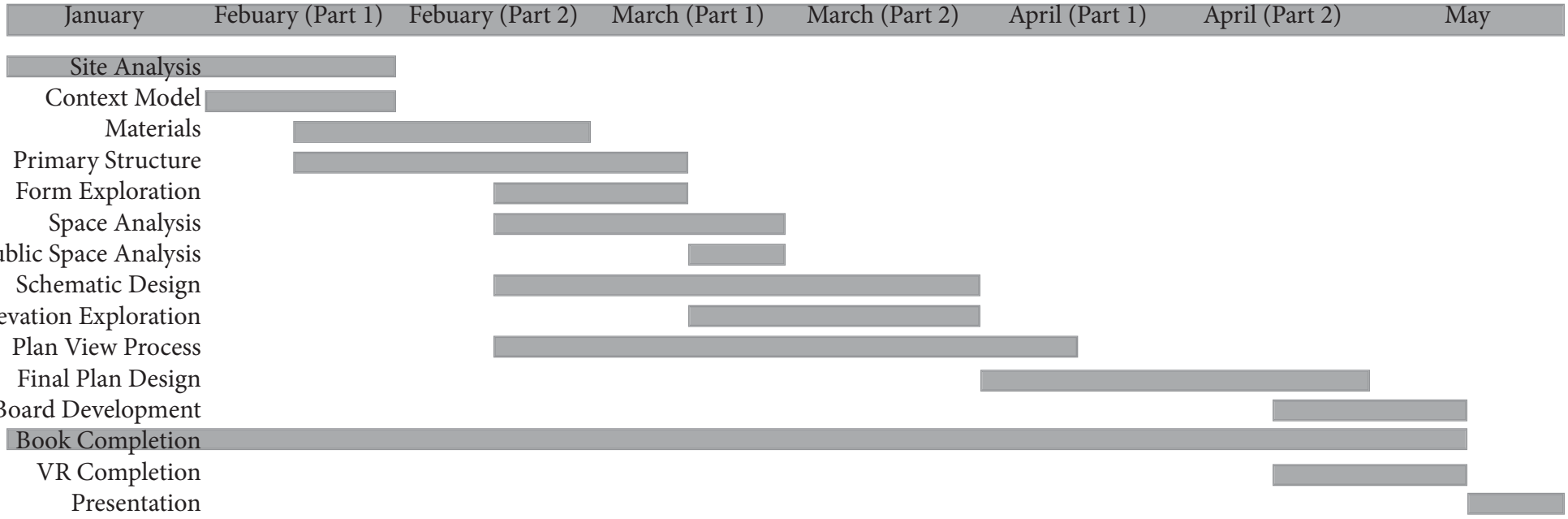
Schedule...

The project schedule for the Spring 2017 Semester will be planned out on a weekly basis for tasks to be competed. These deadlines will be subject to change, as the project will surely evolve during the design process. >

The first few dates will remain firm in order to get the ball rolling. This week by week deadline schedule is strict enough to ensure progress is being made at any point in the semester. But it is also lenient enough to allow for impromptu events such as site visits and alternative research opportunities. On the next page is a diagram to display the general timeline of when tasks will be addressed throughout the semester. It shows the task, time of semester and the duration that task is estimated to prolong for. This will serve as the general guide to keep in mind at the beginning of the studio class as well as the proceeding weeks to follow.

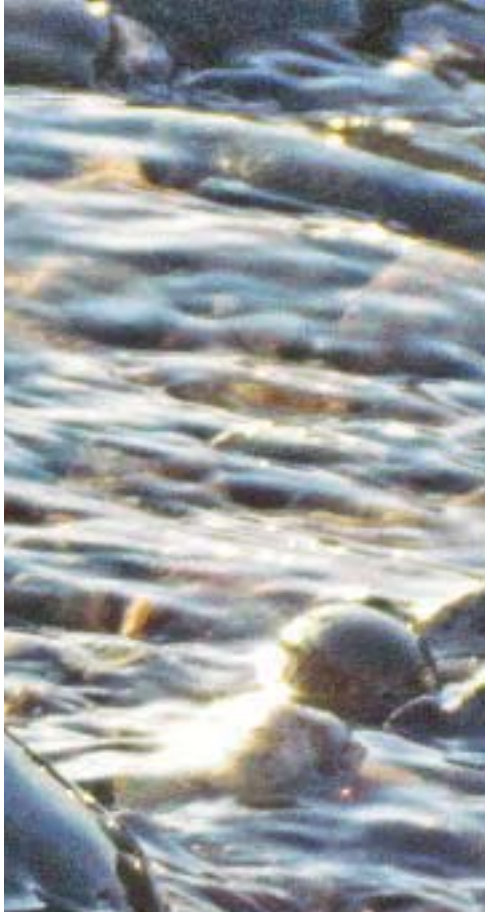
Checklist for Weekly Documentation...

- [ ] Tasks to be completed that week
- [ ] Extra research done that week
- [ ] Input new info and process into book
- [ ] Photograph process drawings if applicable
- [ ] Document discussions with advisor
- [ ] Create new questions for advisor
- [ ] Note overall progress of project
- [ ] Are we up to speed with the schedule?
- [ ] Backed up work to Drive and USB
- [ ] Review with fellow students each week


January
Febuary (Part 1)
Febuary (Part 2)
March (Part 1)
March (Part 2)
April (Part 1)
April (Part 2)
May
Site Analysis
Context Model
Materials
Primary Structure
Form Exploration
Space Analysis
Public Space Analysis
Schematic Design
Elevation Exploration
Plan View Process
Final Plan Design
Board Development
Book Completion
VR Completion
Presentation

Spring Semester 2017: Project Design Process

The semester of design takes the research gained from the fall semester and applies it to the design process. During the transition between research and design it was concluded that the bulk of the project should put emphasis on the water research portion of the program as this would hold the best chance of agreement during the graduate critiques. Summarized in the following pages are the final thesis statements for the project along with the design process used. With the end showing the final conceptual design that was reached at the end of the allotted time. Though the design process itself is a never ending one, this is however the result found when using said research to design in 4 months.



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BREAKING THE ICE
A TRANSPARENT EXHIBITION

Thesis Statement:

Though there has been a negative stigma associated with boathouses in Minnesota, more can be done to improve their reputation as an architectural icon on northern US lakes…

The Problem in a Nutshell

-Boathouses are slowly becoming a thing of the past due to them being illegal in MN

-They are now known for their harsh effects on the environment (flaking paint, chemical spills, ect.)

-MN building codes limit repairs effectively phasing out the concept

-This leads to more deteriorating buildings shedding parts into the ecosystem

-If the cycle does not end, MN could be boathouse free in no time

Issues for the Project to Solve

-Material choices that do less harm to the environment

-Preventative measures should be taken to minimize damage to the building

-Structure that is resilient against the environment

-Avoid construction during important ecological seasons

-Limit visual impact on neighboring areas, homes and businesses

List of Previous Styles of Lakeshore Architecture for Lake Superior:

-Native American camps

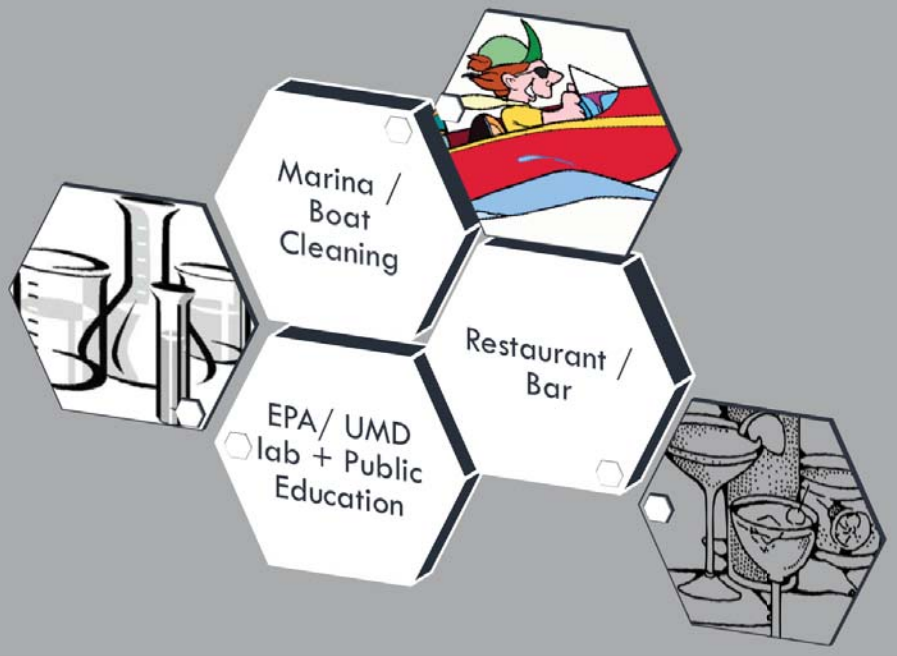
-Logging companies

-Shipping companies

-Commercial buildings

-Residential homes

-Fish hatcheries



The Building Program

-Research Display for the Environmental Protection Agency and the University of Minnesota - Duluth

-Public Education

-Boat Cleaning

-Restaurant

-Public Marina

The Building Site (as previously discussed) :

-North shore of Lake Superior

-Eastern most edge of the Lakeside neighborhood in Duluth, MN

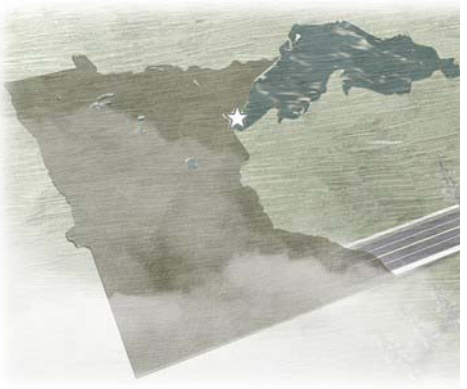
-Intersection of Lester River and Lake Superior

-Why Duluth?

-Largest city in northern MN (metro pop. = 280,000 people)

-Sits on the largest body of fresh water (31,700 SQ miles)

-Strong enough population to sustain a project like this



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Why this Site? Why Lake Superior? (as previously discussed) :

-(1)Site of the old Duluth Fish Hatchery

-Halfway point of an 11 mile stretch between two safe harbors

-Lakeside neighborhood has 8,500 potential users

-(2)Across the highway from the MN EPA

-(3a & 3b) Rest stop between in town and north shore bicycle trail

-(4) Start of Minnesota Scenic Highway 61

Problems to Solve with the Site (as previously discussed) :

-(1) Trailer access to and from HWY 61 could be difficult

-(2) Parking may be limited on the site

-(3) Building may block lake views for the neighbors up hill

-(4) Building may eliminate too much existing beach

-(5) Harsh waves, ice and wind come off the lake onto the site

-(6) Existing building on the site is registered as a historical building

Existing Building - Duluth Fish Hatchery:

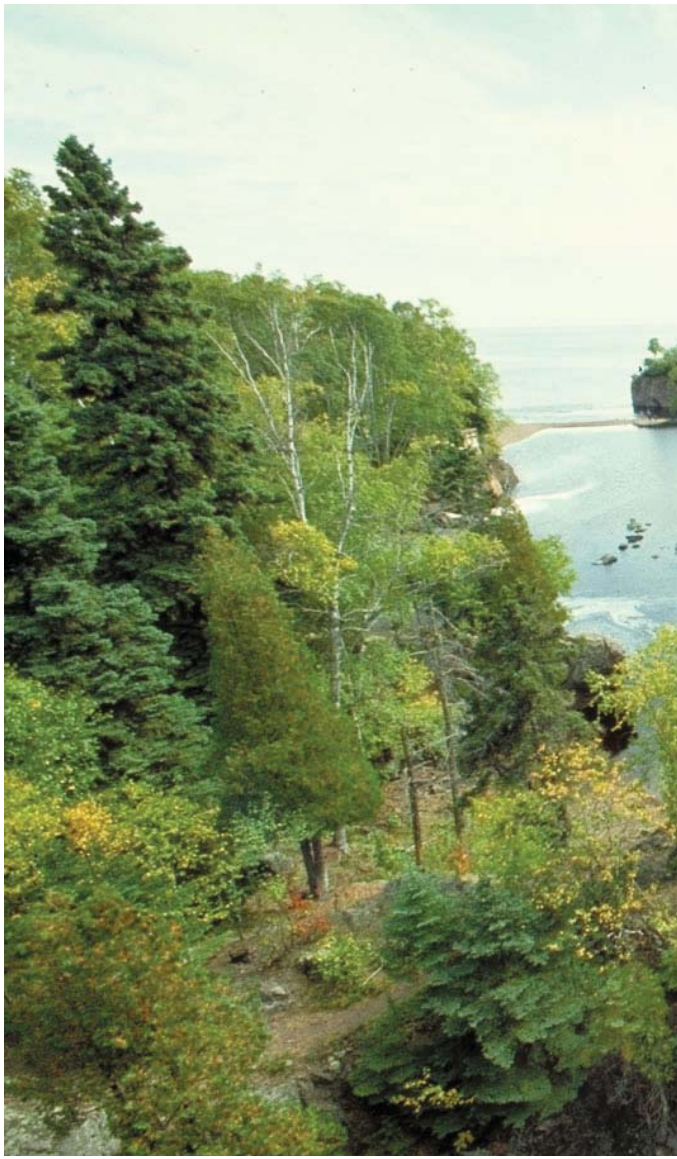
-Vacant building that was restored by University of Minnesota Duluth in 1977

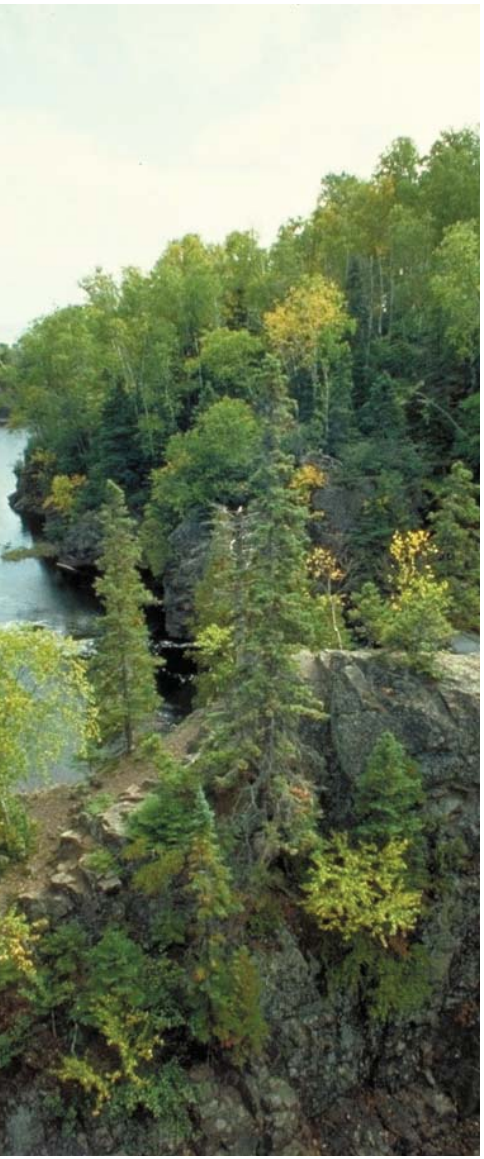
-Currently used for storage

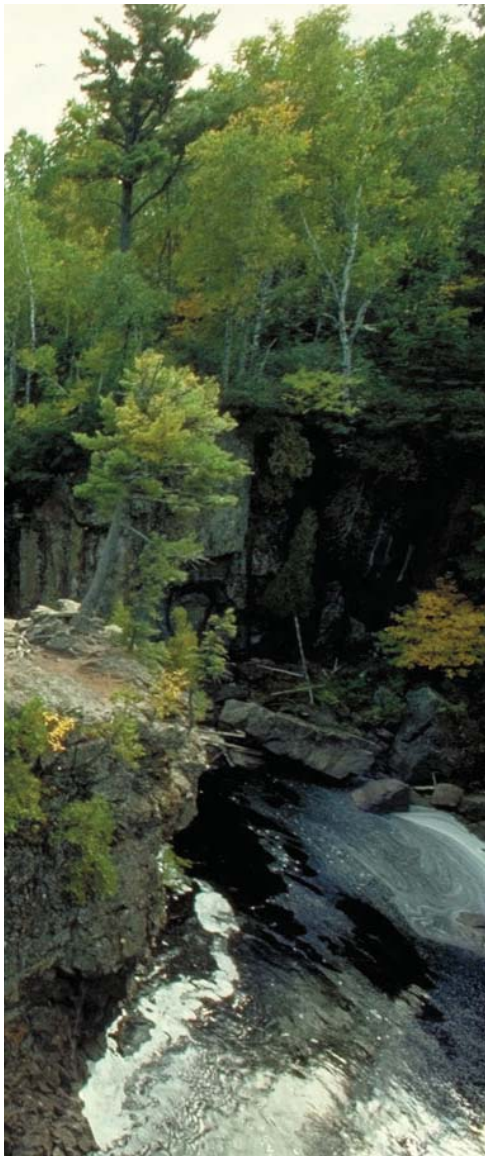
-Site is used by UMD for its limnology classes

-Typical craftsman design

-The problem? What's the best way for these two buildings to interact







Site Issues that this Project is able to Tackle (with options):

Trailer access and parking: on the site and kept small, off the site, adjusted highway

Views to the lake for others: split the building, move to the far west, lower building into the ground

Keeping the beach: make the building skinny, back building away from shore, create new beach area

Waves, ice and wind: building acts as a wind / wave block, natural material safe harbor

Existing building: tear down, boathouse plays off the architecture, connect to boathouse

Interviews & people of inspiration:

Jeff Denny -

-Biologist, US EPA, Duluth, MN

-US Environmental Protection Agency, Mid-Continent Ecology Division

-Studies the ecological effects of water on fish, wildlife and ecosystems

-Works on several projects that would be displayed in the lab section of the project

John Todd Ph. D. -

-John Todd Ecological Design

-Biologist

-Living Machine – engineered wetlands sewage treatment

-Waste water treatment

Masaru Emoto -

-Author, Researcher, Photographer and Entrepreneur

-Researched the effect of human consciousness on the molecular structure of water

-“water is the blueprint for our reality”

-Water changes depending on what it is exposed to in the world

What I learned from this:

-Make space for changing lab designs depending on what is being researched

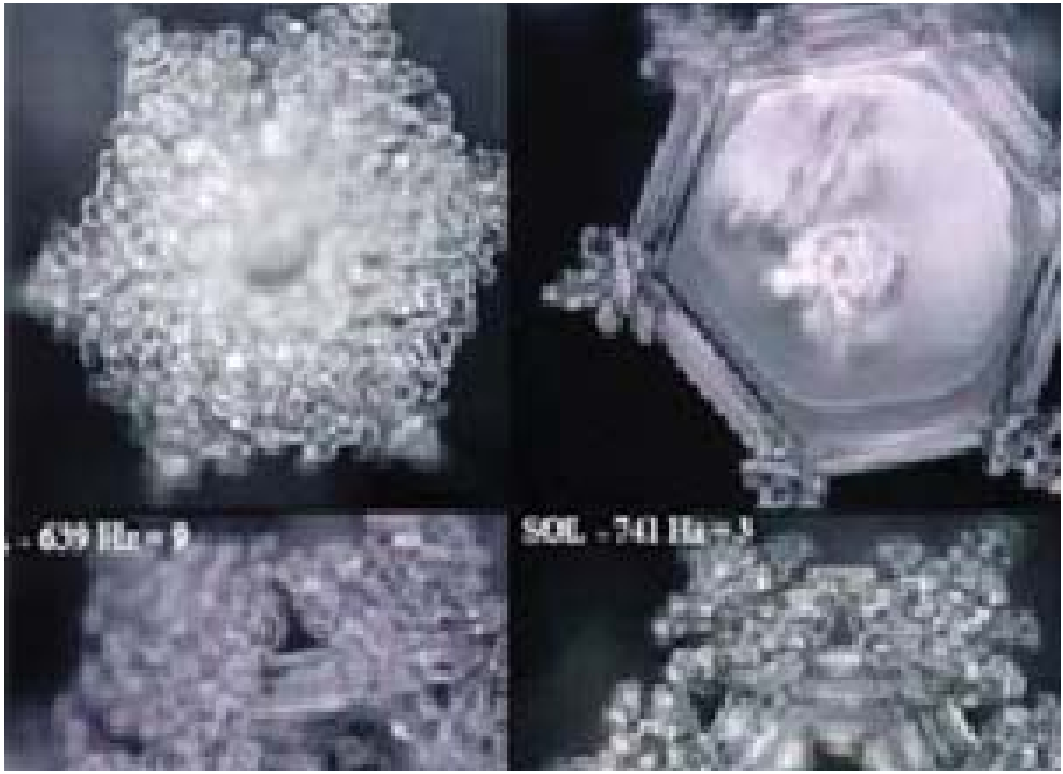
-Have layers for display, both for viewing and interaction

-Public and private lab areas, some work may need to be discrete

-Building form and space design should match this areas effect on water

-Important to give something back to offset the impact of the building on the land

-Incorporate the building into the land and the land into the building



Next Step: Design Process

-Series of questions, with multiple answers to each question (quantum thinking)

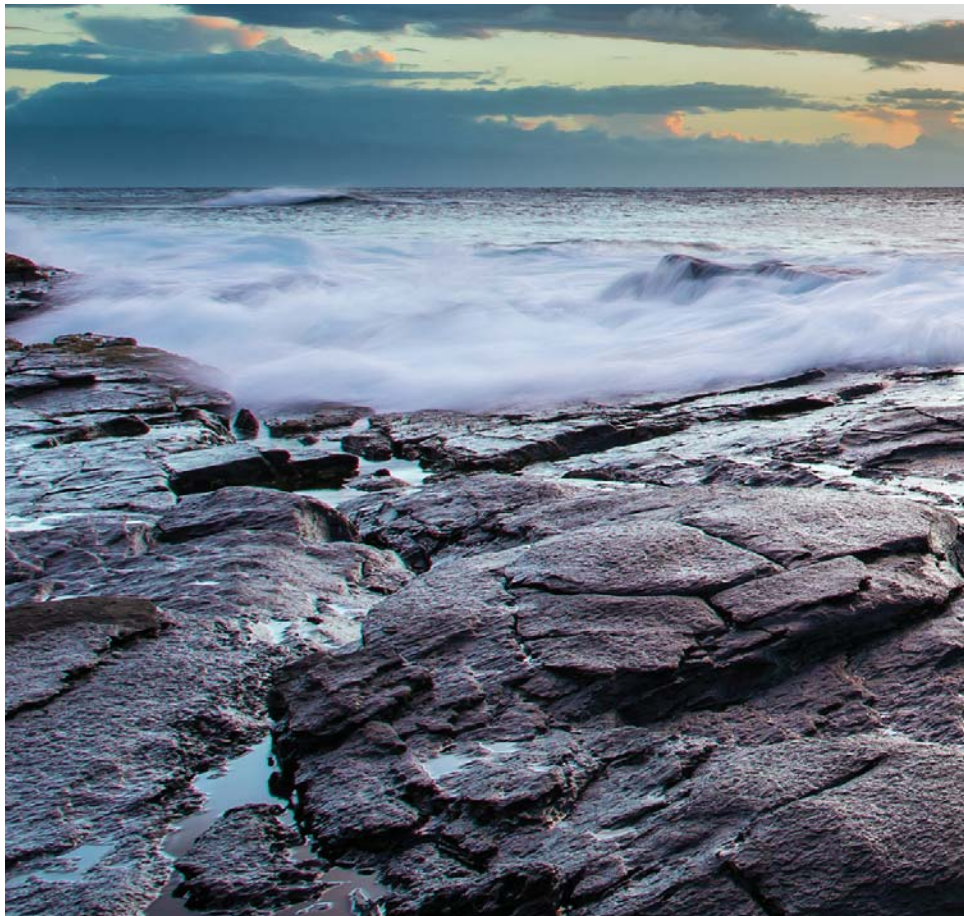
-Each problem comes with its own set of solutions

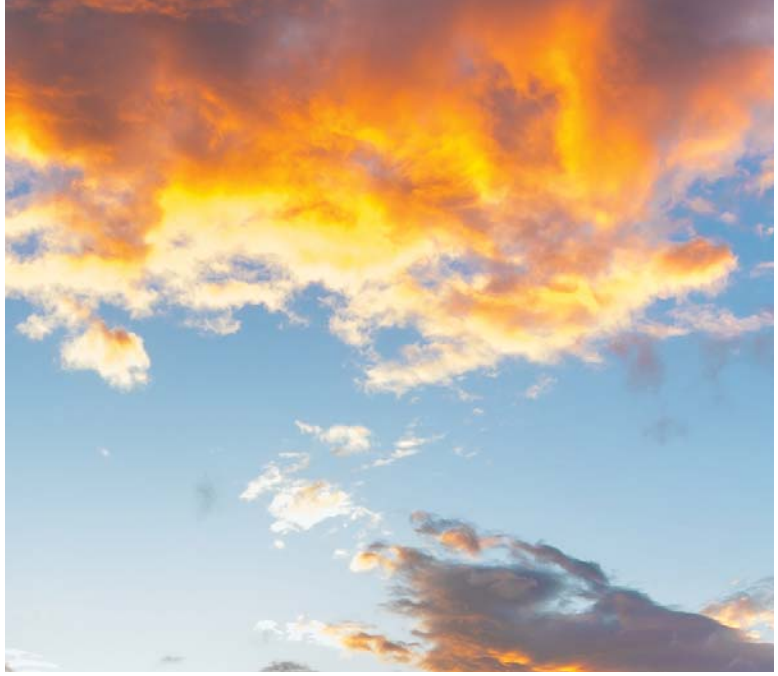
-Each solution comes with its own set of pros and cons in regards to the project

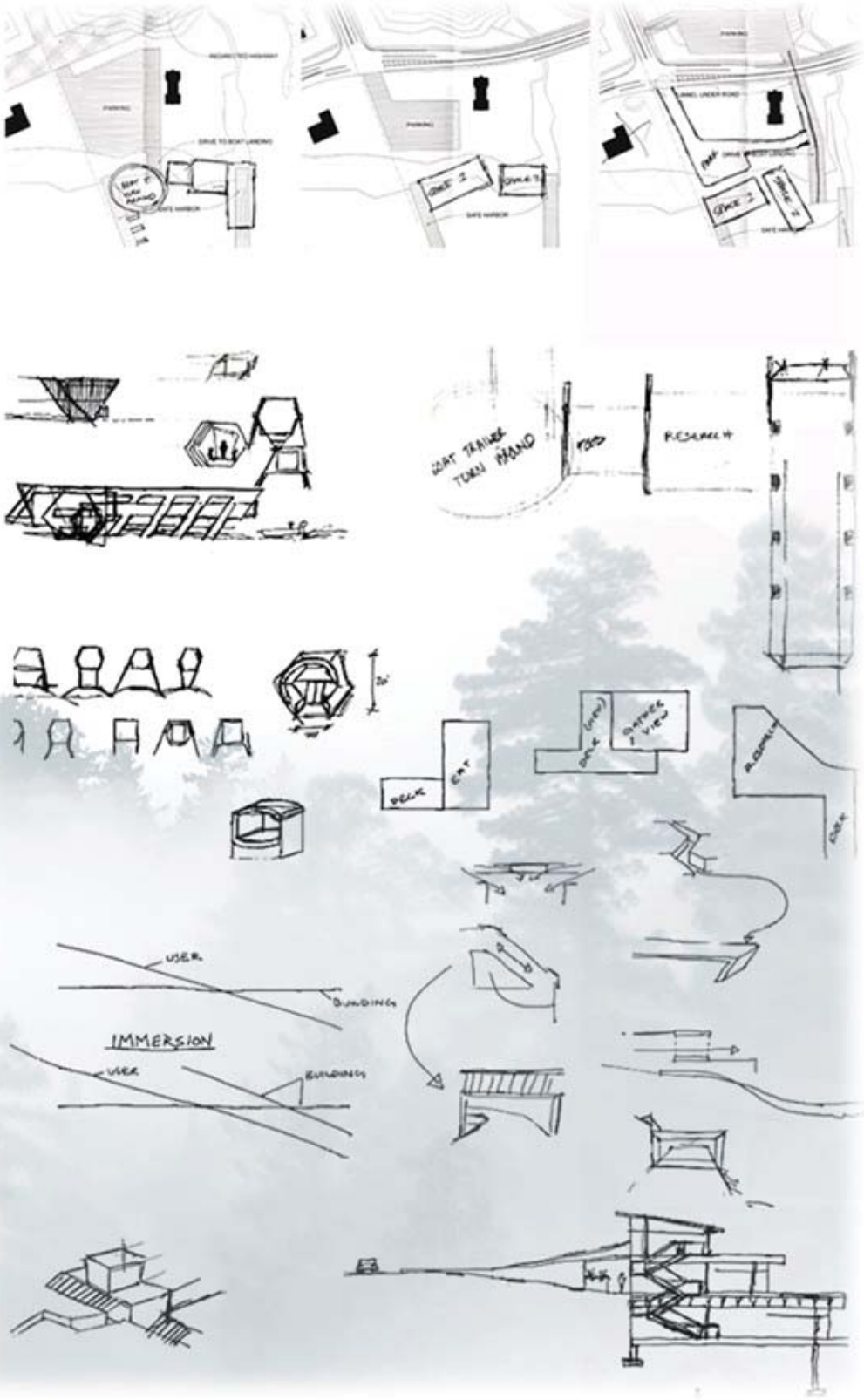
-The best, or “Right” answer is sought to be chosen for each issue

-The ideal combination of these answers is to reveal the project

-finding out “what it wants to be”



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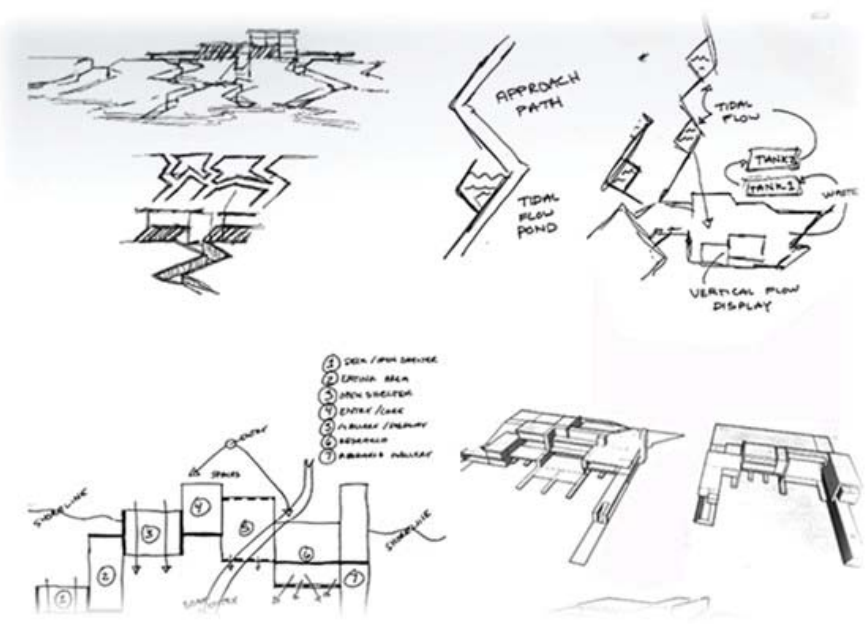


Programatic Responce (First Try) :

-Strictly based upon the square footage needs of the building program

-Rustic modern design to play off of technology vs nature

-Each space is its own separate part of the building

-Set into the landscape

-Boat launch immersed within the building

-Overhangs or piers extending out to the water

-Multiple levels of entry

-People should feel a sense of immersion as they approach the space

-Site and building should be able to give back to their surroundings

So was this initial design responce the “Right Answer?”

-Not quite…

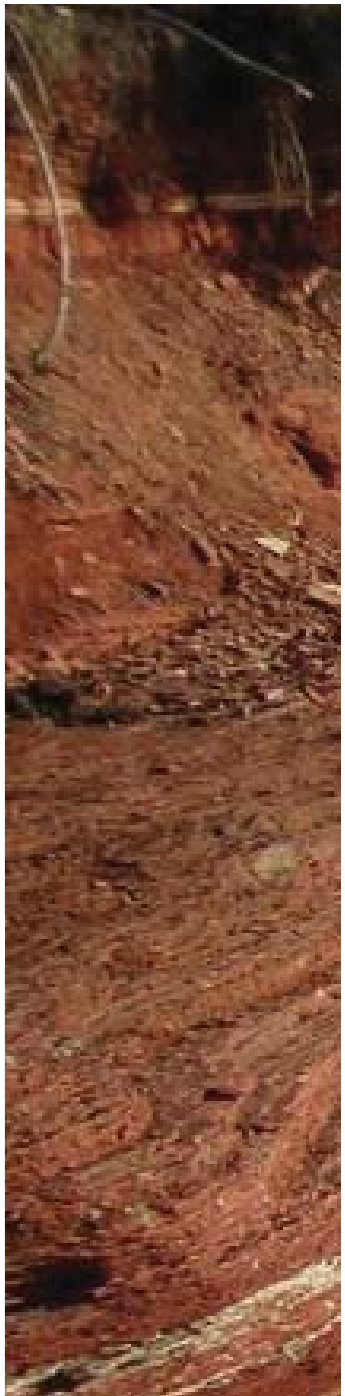
-Design did not display quite the poetic sense in which the project needed

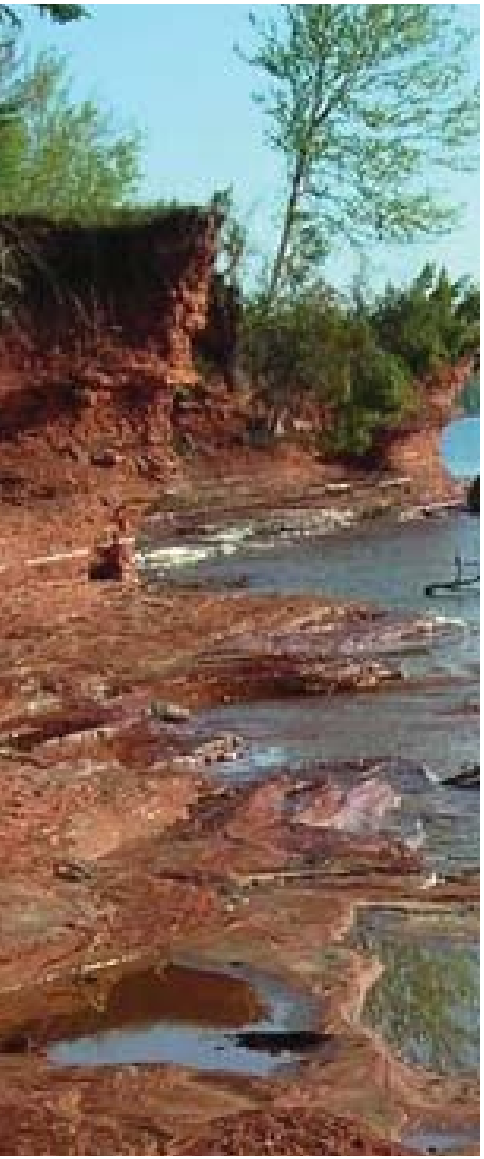
-Was set on the land rather than set into the land

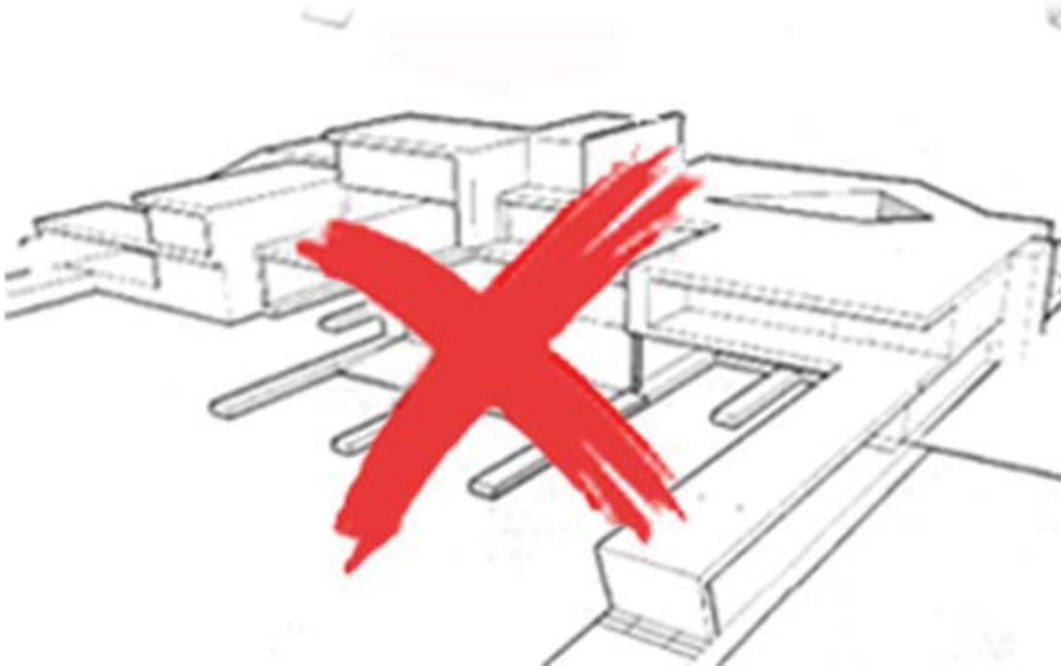
-Heavy handed design too modern for the area & site

-Spaces did not flow very well

-Essence of the inspiration was not seen in the architecture







New Inspiration

Ice Stacking:

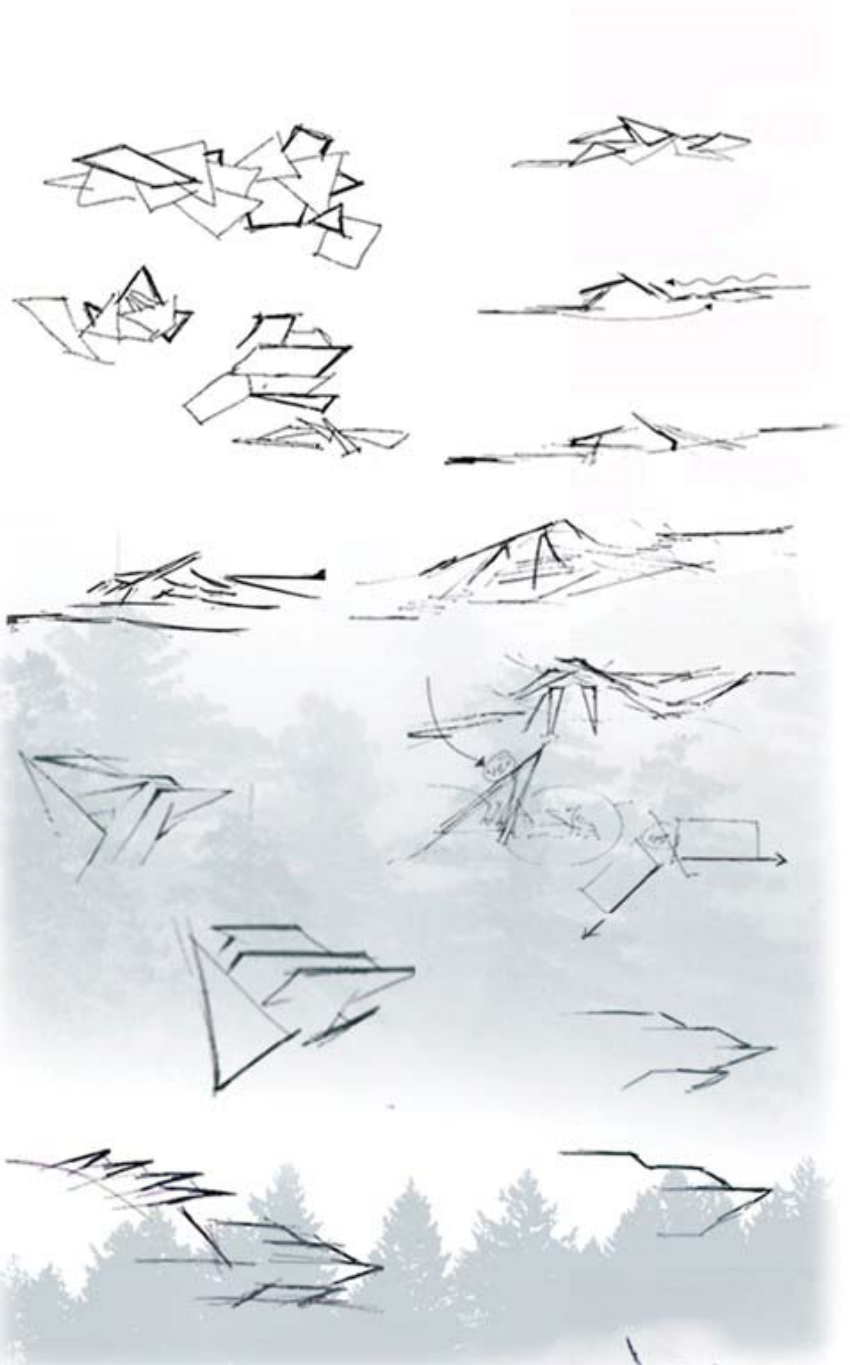
-Using the beauty of ice stacking we can have a more poetic response to the design problem

-Ice stacking is a large feature of delicate grace yet can cause damage to structures along the lake

-Chaos theory – natures random yet consistent breaking and stacking of ice plates create unique forms

-Reflectivity – several plates were angled creating a mirror effect of several form organizations

-There were many aggressive angles with great architectural potential in both models and pictures



Ice Stacking Design Process:

-Investigation into the forms created

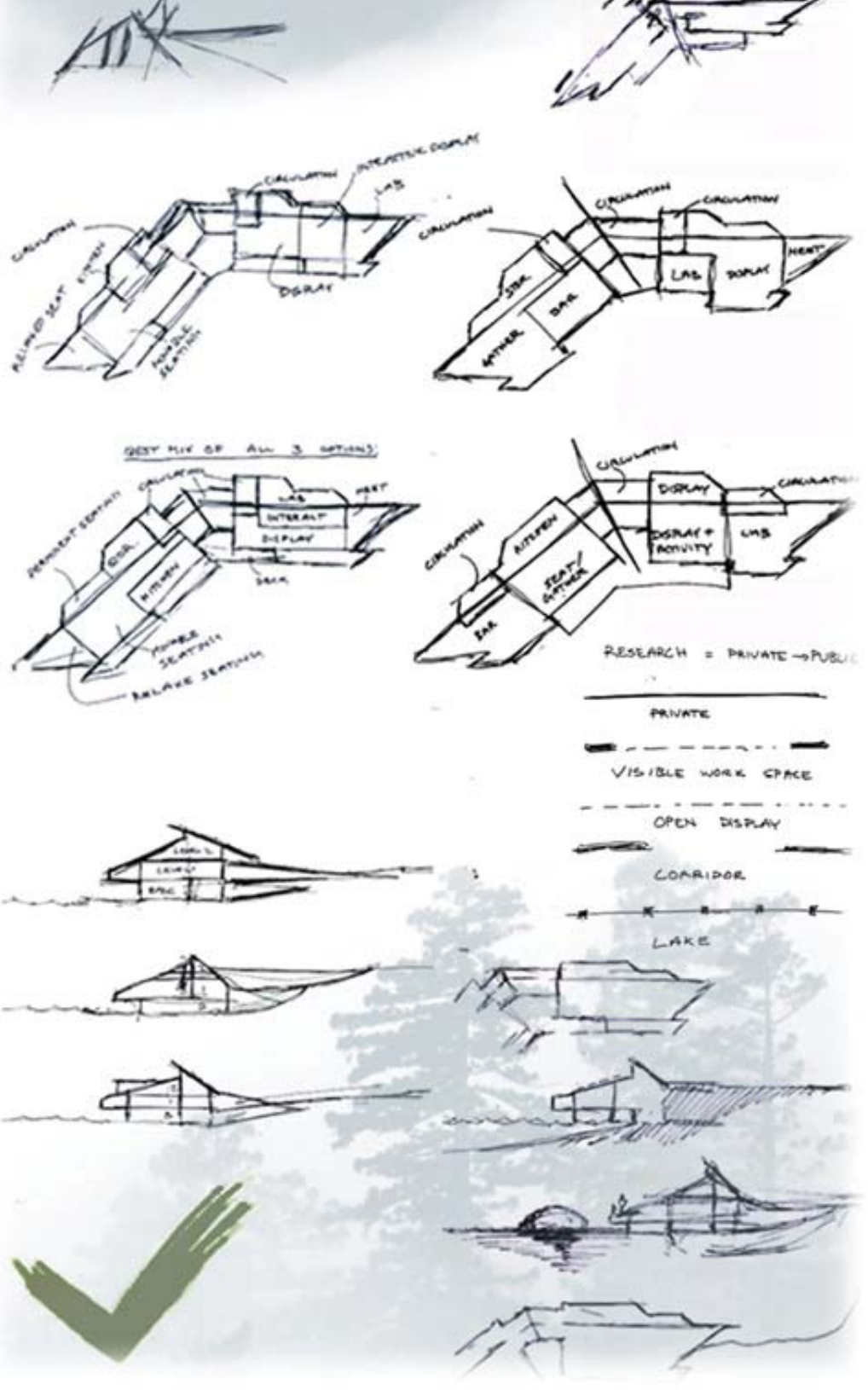
-Noting similarities of each plate section

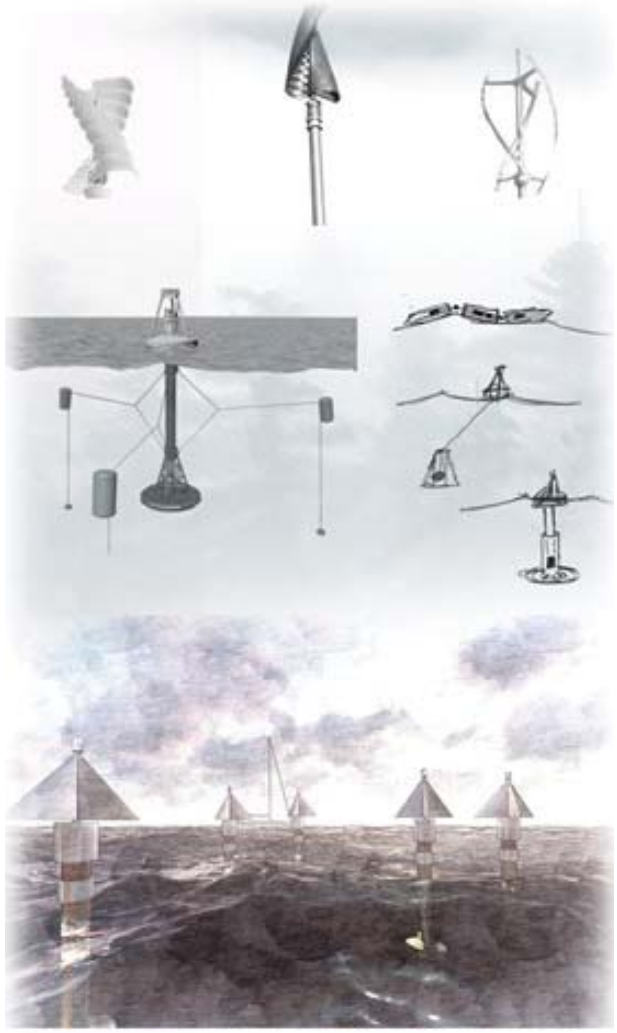
-Finding architectural opportunities

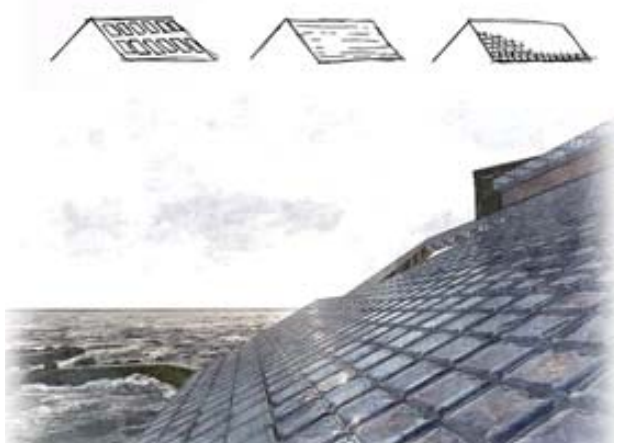
-Bumping up the scale to be more human

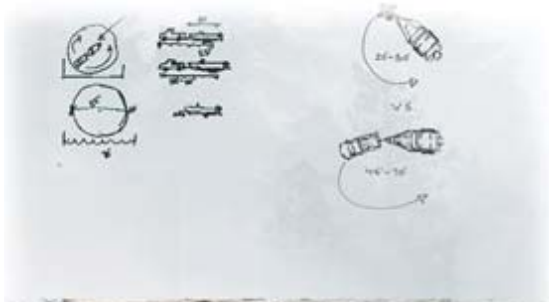
-Ways to match the existing building on site

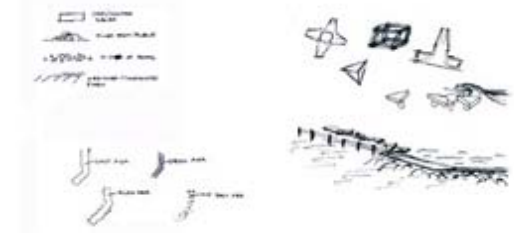
-Keeping the forms yet fitting the program


CIRCULATION
DISPLAY
LAB
RESEARCH = PRIVATE → PUBLIC
PRIVATE
VISIBLE WORK SPACE
OPEN DISPLAY
CORRIDOR
LAKE









Giving back to the local Environment:

-Energy:

-Turbine Power Buoy

-Solar shingles (hats off to Elon Musk)

-Prevention:

-Robotic Rovers to retrieve and clean boats

-Wave Breakers

-Ability for reuse with only having only 3 main bearing walls (long life loose fit)

-Site entry mixed with Living Machine + the sense of “immersion”

-Low building profile to conserve the lake views from the neighbors up north

Final Design Plans

Final Site Design

(1) Trailer parking

(2) compact parking

(3) Existing building

(4) Entry paths w/ Living Machine

(5) Engineered Wave Breakers

(6) Natural Wave Breakers

(7) New beach space

(8) Turbine Power Buoys

(9) Boat cleaning beneath building


Highway 61
(1)
(2)
(3)
(4)
(5)
(5)
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(6)
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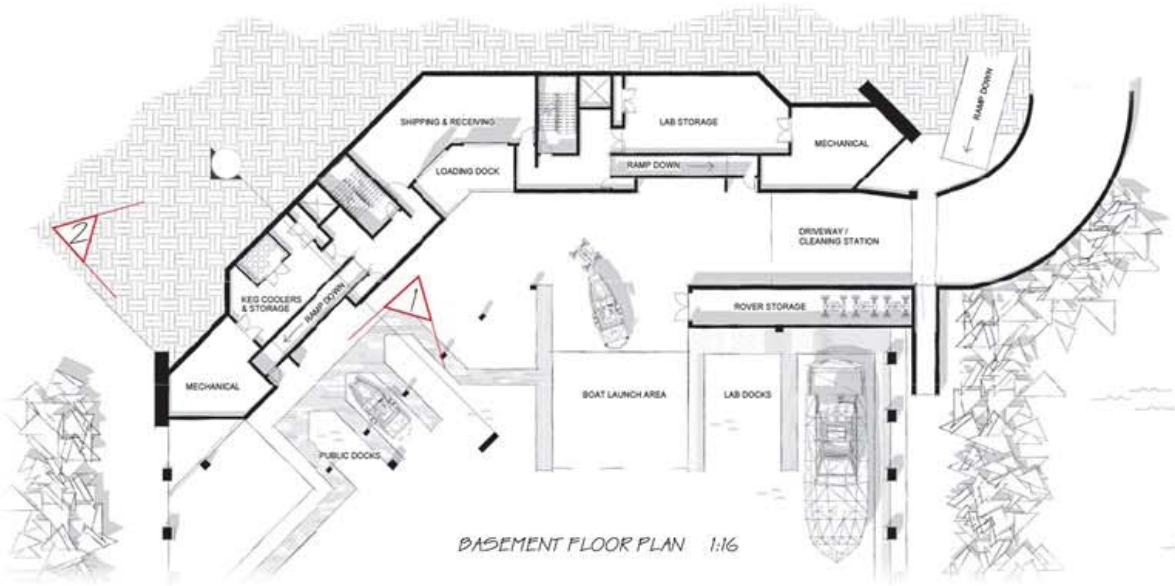


BASEMENT FLOOR PLAN 1:16

LEVEL ONE FLOOR PLAN 1:16

Basement Floor Plan:

Public and lab docks

Boat launch area

Boat cleaning station

Rover storage

Mechanical

Restaurant & lab storage

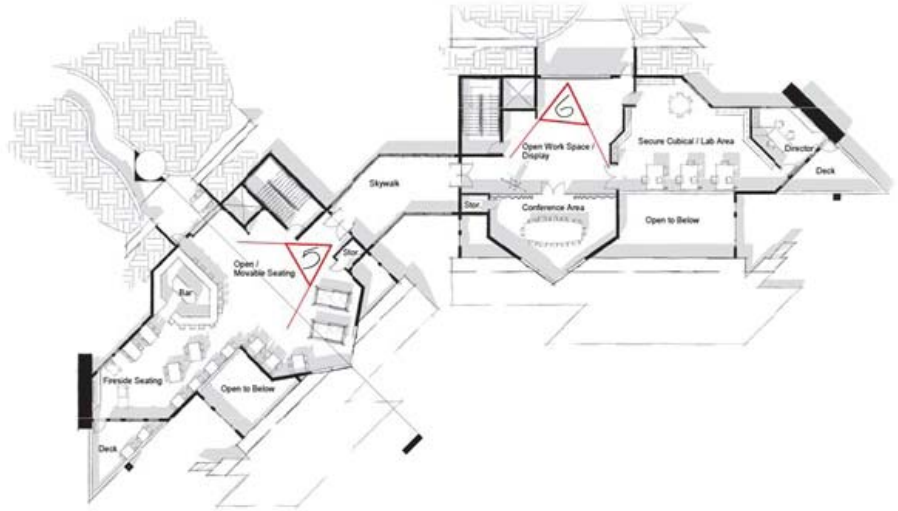
Loading dock & receiving garage

Level One Floor Plan:

Entry deck

West wing – kitchen, dining, restrooms

East wing – Lab lobby, presentation, display space, conference, break area, private lab, restrooms



LEVEL TWO FLOOR PLAN 1:16

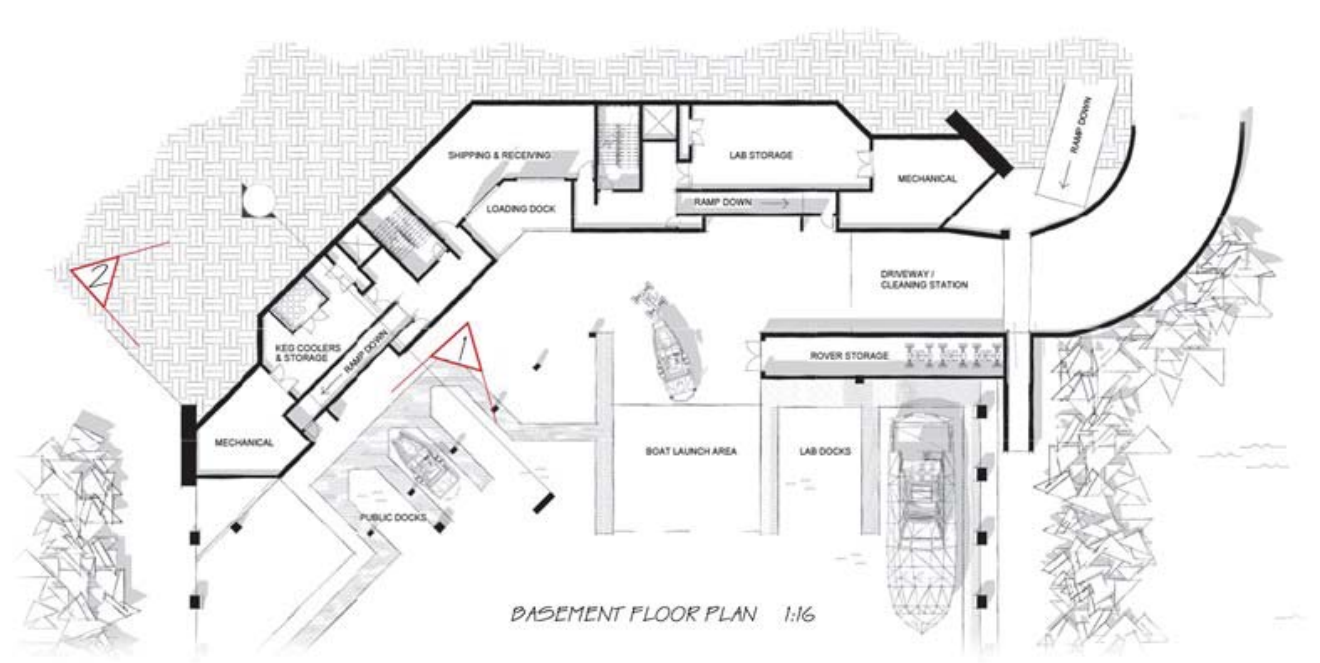
Level Two Floor Plan:

Skywalk to bridge wings

Entries at “ground” level

West wing – bar, open floor with lake views, fireside seating with lake views

East wing – open work space / display, conference with lake views, secure lab area with private office

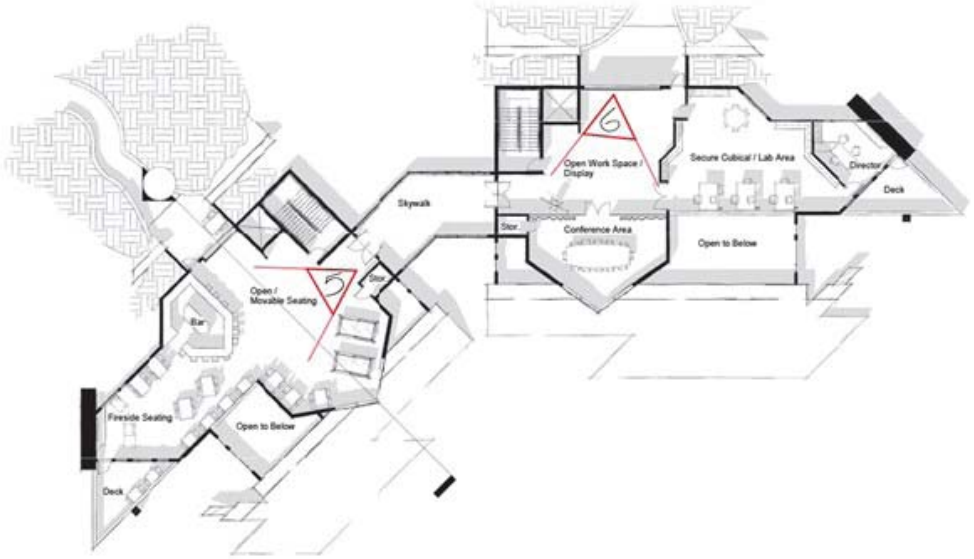

SHIPPING & RECEIVING
LOADING DOCK
LAB STORAGE
RAMP DOWN
MECHANICAL
RAMP DOWN
DRIVEWAY / CLEANING STATION
2
KEG COOLERS & STORAGE
RAMP DOWN
1
ROVER STORAGE
MECHANICAL
BOAT LAUNCH AREA
LAB DOCKS
PUBLIC DOCKS
BASEMENT FLOOR PLAN 1:16


1

Interior Perspectives:

LEVEL ONE FLOOR PLAN 1:16

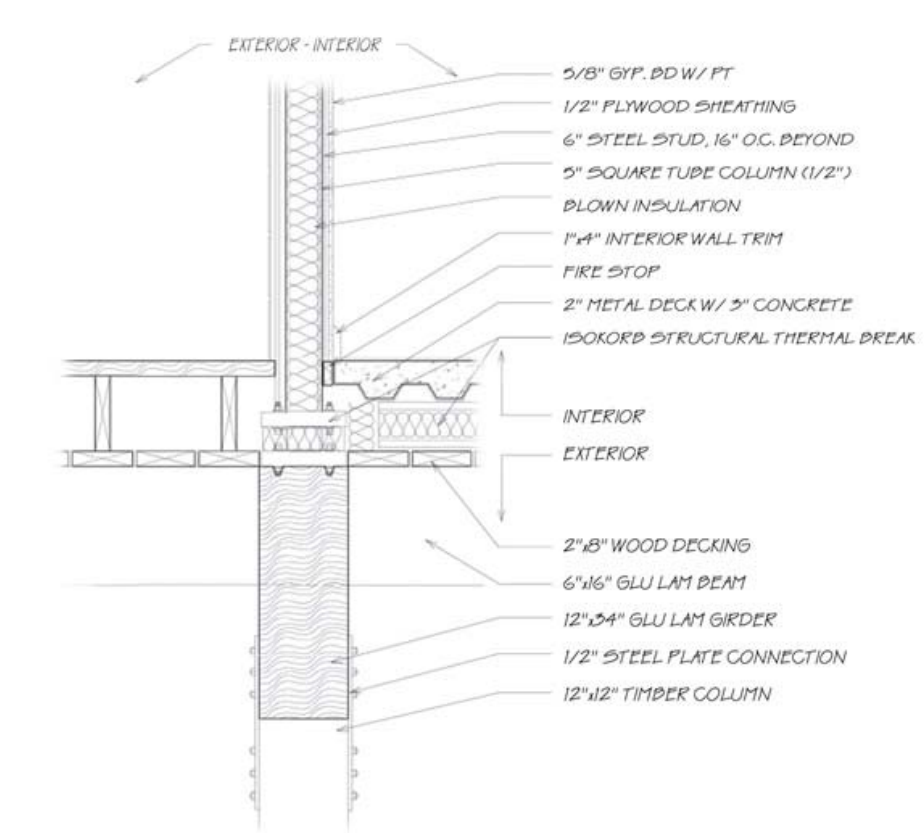
Interior Perspectives:

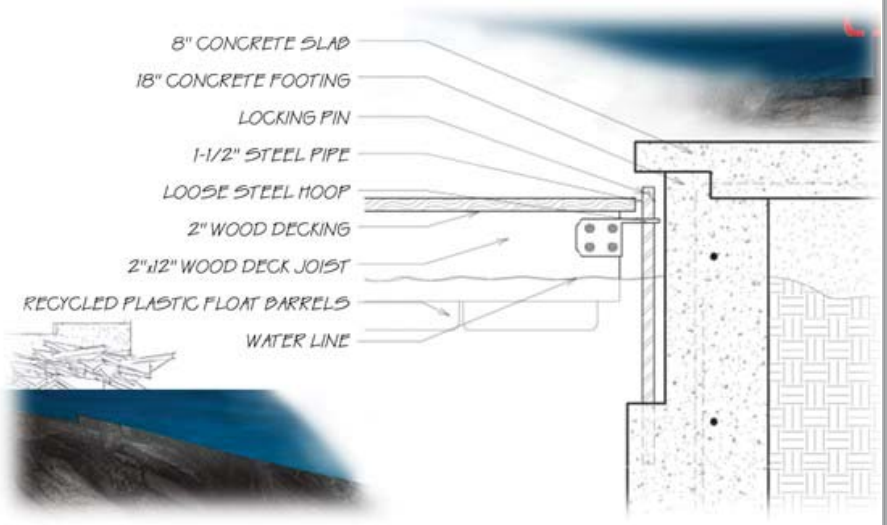


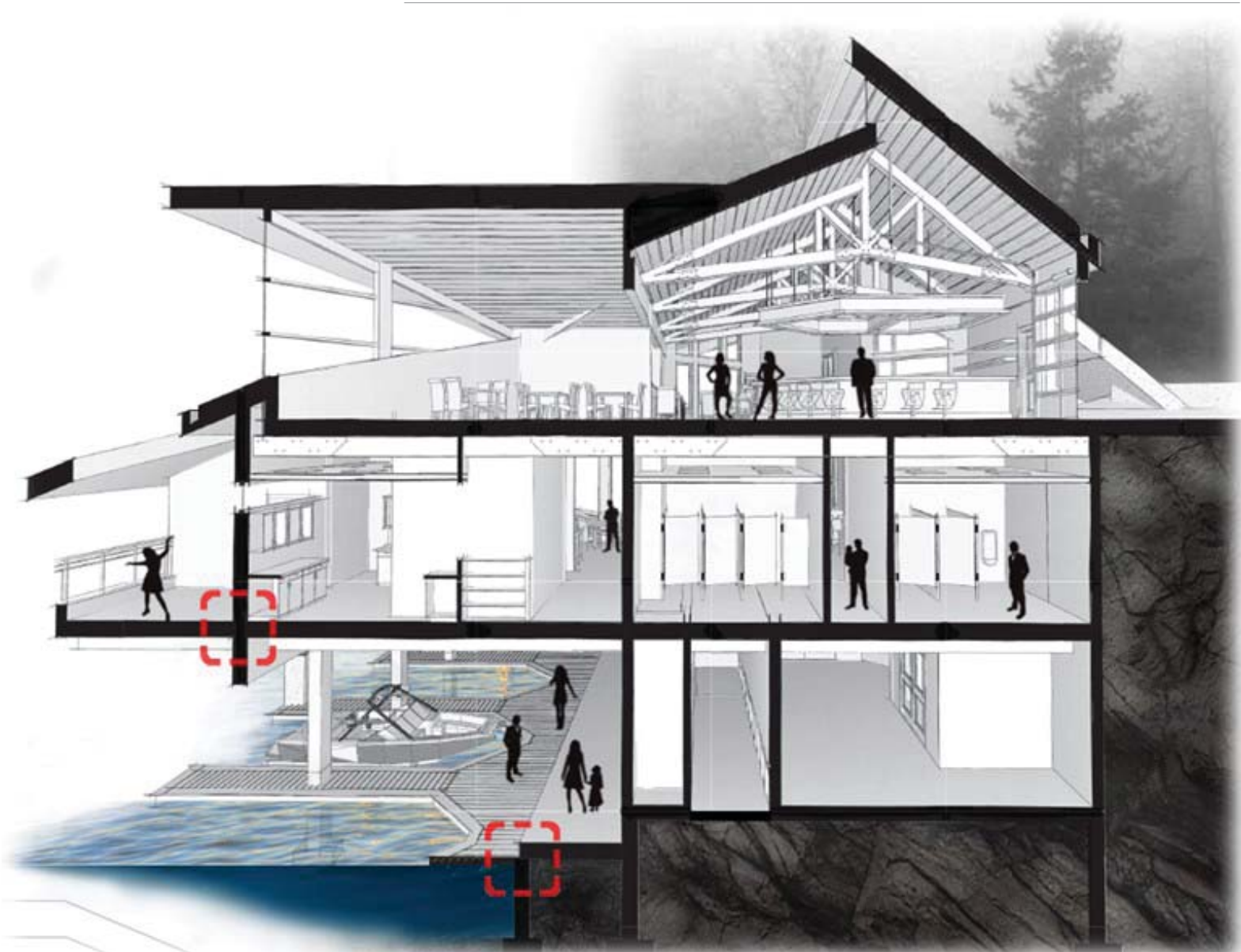
LEVEL TWO FLOOR PLAN 1:16

Interior Perspectives:

Section & Associated Details







Thesis Statement

Though there has been a negative stigma associated with boathouses in Minnesota, more can be done to improve their reputation as an architectural icon on northern US lakes…

The hope is that this conceptual project will shed light not just on this issue, but on the solutions that may be used to save this style of architecture in northern Minnesota. By incorporating ways for the building, the site and the people to have a positive impact on the local environment we can see a change from this negative stigma currently resting on Minnesota boathouses.

The architecture is simply a vehicle, the impact it has is up to us.


BREAKING THE ICE
A TRANSPARENT EXHIBITION

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